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THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
AGRICULTURAL RESEARCH ADMINISTRATION
UNITED STATES DEPARTMENT OF AGRICULTURE

NATION-WIDE RESULTS WITH FUNGICIDES IN 1948
FOURTH ANNUAL REPORT

Supplement 181 March 15, 1949

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

PLANT DISEASE REPORTER SUPPLEMENT

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

NATION-WIDE RESULTS WITH FUNGICIDES IN 1948
FOURTH ANNUAL REPORT

Compiled by
The Fungicide Committee of the American Phytopathological Society:
Sub-Committee on "Summation of the Performance of Newer Fungicides"[1]

Plant Disease Reporter
Supplement 181 March 15, 1949

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[1] Members of Sub-committee:

E. E. Clayton, Division of Tobacco, Medicinal, and Special Crops, Plant Industry Station, Beltsville, Md.
M. C. Goldsworthy, Division of Fruit and Vegetable Crops and Diseases, Plant Industry Station, Beltsville, Md.
R. J. Haskell, Extension Service, U. S. Department of Agriculture, Washington, D. C.
J. W. Heuberger, Agricultural Experiment Station, Newark, Del. -- Chairman
R. W. Leukel, Division of Cereal Crops and Diseases, Plant Industry Station, Beltsville, Md.
W. D. McClellan, Division of Fruit and Vegetable Crops and Diseases, Plant Industry Station, Beltsville, Md.
Paul R. Miller, Division of Mycology and Disease Survey, Plant Industry Station, Beltsville, Md.

1948 REPORT OF SUBCOMMITTEE ON ANNUAL SUMMARY OF RESULTS ON NEWER FUNGICIDES

The increased response of plant pathologists in the United States, Canada, and Mexico has made possible a more adequate coverage of work with the newer fungicides. Information was received from professional workers located in the United States, Canada, and Mexico. The reports include results with more than 175 different fungicides used on 65 kinds of plants. Thanks are due to all who cooperated.

This summary does not in any way represent final conclusions or imply recommendations of any sort. It is necessarily incomplete in scope as it covers only results of experiments in 1948 that were submitted to the committee by cooperators. It has been prepared solely for the information of professional people concerned with plant disease control. It probably gives a fair indication of the current trend of results with new fungicides and also brings out some of the variations in performance met with by workers in different areas. In many cases it is difficult to explain these variations. Their occurrence, however, points to the existence of important factors influencing the effectiveness or safety of the fungicides.

After reading this report, will you do the Committee the great favor of sending in your criticisms and suggestions so that next year's summary can be improved.

LIST OF COOPERATORS

State or Province	Cooperators	Place[2]
ALABAMA	Coyt M. Wilson	Auburn and Fairhope
	A. L. Smith	Auburn
ARKANSAS	E. M. Cralley	Fayetteville
	J. P. Fulton	Fayetteville
	H. R. Rosen	Fayetteville
	V. H. Young	Fayetteville
CALIFORNIA	K. F. Baker	Los Angeles
	T. de Wolfe	Riverside
	Dan Irving	Hollister
	L. J. Klotz	Riverside
	Norman Lawler	Clarksburg
	L. D. Leach	Davis
	J. W. Oswald	Davis
	Arthur H. Williams	Biggs
	C. E. Yarwood	Santa Rosa, Hollister and Fairfield
COLORADO	Ralph R. Baker	Denver and Fort Collins
	H. E. Brewbaker	Longmont
	E. F. Darley	Ault
	G. W. Deming	Fort Collins
	A. R. Downie	Rocky Ford
	J. A. Elder	Ault
	John O. Gaskill	Fort Collins
	Richard Graham	Grand Junction
	W. J. Henderson	Grand Junction and Canon City
	A. O. Simonds	Fort Collins
	R. L. Skiles	Arkansas Valley
	W. D. Thomas	Arkansas Valley, Clifton, Grand Junction, Denver, and Fort Collins
CONNECTICUT	P. J. Anderson	Windsor
	Saul Rich	Mount Carmel
	E. M. Stoddard	Mount Carmel
DELAWARE	H. W. Crittenden	Georgetown, Selbyville
	S. H. Davis	Bridgeville
	J. C. Dunegan	Dover
	M. C. Goldsworthy	Dover

[2] In most cases, place where work was done.

State or Province	Cooperators	Place
(Delaware)	J. W. Heuberger	Milton and Wyoming
	P. C. Poulos	Milton
	R. A. Wilson	Dover
FLORIDA	J. R. Christie	Sanford
	Fred Clark	Gainesville
	R. A. Conover	Homestead
	A. H. Eddins	Hastings
	A. A. Foster	Sanford
	R. R. Kincaid	Quincy
	R. O. Magie	Bradenton
	H. N. Miller	Bradenton
	G. K. Parris	Leesburg
	G. D. Ruehle	Homestead
	D. L. Stoddard	Indiantown and Belle Glade
	J. M. Walter	Bradenton
GEORGIA	J. G. Gaines	Tifton
	B. S. Hawkins	Griffin
	Bruce Blair	Idaho Falls
	W. C. Hemingway	Moscow
	Ronald Robinson	Moscow
	R. D. Watson	Moscow
	Carl Whiting	Idaho Falls
ILLINOIS	J. C. Carter	Urbana
	R. G. Emge	Urbana
	J. L. Forsberg	St. Anne
	Benjamin Koehler	Urbana
	M. B. Linn	Urbana
	D. Powell	Urbana
INDIANA	J. R. Shay	Lake Cirott
IOWA	W. F. Buchholtz	Ames
	N. Gerhold	Conesville, Ames, and Crystal Lake
	J. L. Hardy	Ames
	W. J. Hooker	Conesville, Ames, and Crystal Lake
	G. L. McNew	Ames
	Delmar Ogden	Mason City
	Charles S. Reddy	Ames

State or Province	Cooperators	Place
KANSAS	E. Abmeyer	Walthena
	A. L. Clapp	Manhattan
	Earl D. Hansing	Manhattan
	C. L. King	Manhattan
	W. W. Willis	Manhattan
LOUISIANA	J. G. Atkins, Jr.	Baton Rouge and Hammond
	D. C. Neal	Baton Rouge
	J. C. Taylor	Calhoun
MAINE	Reiner Bonde	Presque Isle
	M. T. Hilborn	Monmouth
	J. Robinson	Presque Isle
MARYLAND	C. E. Cox	Hurlock
	J. C. Dunegan	Beltsville
	W. F. Jeffers	College Park
	M. C. Goldsworthy	Beltsville
	J. E. Kotila	Beltsville
	R. W. Leukel	Beltsville
	W. D. McClellan	Beltsville
	J. E. Moore	Salisbury
	R. A. Wilson	Beltsville
MASSACHUSETTS	O. C. Boyd	Amherst
	E. F. Guba	Waltham
MICHIGAN	D. J. DeZeeuw	East Lansing
	W. F. Morofsky	Lake City
	J. H. Muncie	Lake City
	Ray Nelson	Kalamazoo and East Lansing
MINNESOTA	A. D. Baskin	Crookston
	H. W. Bockstahler	St. Paul
	C. J. Eide	University Farm
	M. B. Moore	St. Paul
	O. E. Reece	Waseca
MISSISSIPPI	D. C. Bain	Crystal Springs
	J. T. Presley	State College
MISSOURI	H. G. Swartwout	Columbia

State or Province	Cooperators	Place
MONTANA	M. M. Afanasiev	Huntley
	Ray Painter	Missoula
	R. Ralph Wood	Billings
NEBRASKA	Don Firkins	Grand Island
	W. L. Harris	Mitchel
	J. E. Livingston	Lincoln
	R. H. Moore	Union
	W. L. Schuster	Mitchel
	A. F. Sherf	Lincoln
	Orrin Webster	Lincoln
NEW HAMPSHIRE	D. R. Murphy	Durham
	F. R. Racine	Durham
	E. J. Rasmussen	Durham
	M. C. Richards	Durham
NEW JERSEY	J. C. Campbell	Cranbury
	R. H. Daines	New Brunswick
	B. H. Davis	Smithburg and New Brunswick
	B. B. Pepper	Cranbury
	R. B. Wilcox	Toms River
NEW YORK	A. W. Dimock	Ithaca
	C. H. Ford	Farmingdale
	A. A. Foster	Babylon
	J. M. Hamilton	Geneva
	A. G. Newhall	Ithaca
	D. H. Palmiter	Poughkeepsie
	W. T. Schroeder	Geneva
	D. M. Yoder	Ithaca
NORTH CAROLINA	Robert Aycock	McCullers, Boomer, Raleigh and Eagle Springs
	C. N. Clayton	McCullers, Boomer, Raleigh and Eagle Springs
	R. S. Cox	Hendersonville, Raleigh
	D. E. Ellis	McCullers, Raleigh
	J. A. Graham	Raleigh
	T. T. Hebert	Raleigh
	J. M. Jenkins, Jr.	Wilmington
	S. G. Lehman	Raleigh
	G. B. Lucas	Oxford
	E. L. Moore	Oxford

State or Province	Cooperators	Place
(North Carolina)	R. P. Scheffer	Hendersonville
	F. A. Todd	Raleigh
NORTH DAKOTA	W. E. Brentzel	Fargo
	W. G. Hoyman	Northwood
OHIO	C. A. John	Bowling Green
	H. A. Runnels	Wooster
	J. P. Sleesman	Wooster
	J. D. Wilson	Wooster
	H. F. Winter	Wooster
	H. C. Young	Wooster
OKLAHOMA	K. S. Chester	Stillwater
OREGON	J. R. Kienholz	Hood River
	A. P. Steenland	Corvallis
	E. K. Vaughan	Corvallis, Lake Lobish
PENNSYLVANIA	W. S. Beach	State College
	W. A. Chandler	State College
	H. F. Thurston, Jr.	State College
RHODE ISLAND	F. L. Howard	Kingston
	T. E. Odland	Kingston
	J. B. Rowell	Kingston
SOUTH CAROLINA	C. H. Arndt	Clemson
	U. L. Diener	Charleston
	W. M. Epps	Charleston
	H. H. Foster	Hamlin
	T. W. Graham	Florence
	C. H. Rogers	Hartsville
SOUTH DAKOTA	S. H. Edmonds	Sioux Falls
TENNESSEE	J. M. Epps	Jackson
	E. L. Felix	Knoxville
	T. R. Gilmore	Knoxville
	H. E. Heggestad	Greeneville
	D. M. Simpson	Knoxville
	W. W. Stanley	Knoxville

State or Province	Cooperators	Place
TEXAS	L. M. Blank	College Station
	D. R. Hooton	Greenville
	E. W. Lyle	Tyler
	E. C. Tullis	Beaumont
	P. A. Young	Jacksonville
UTAH	Vernal Jensen	Ogden
	Clifton H. Smith	Salt Lake City
VERMONT	A. J. Culver	Bennington
	T. Sproston	Bennington
VIRGINIA	A. B. Groves	Winchester
	W. A. Jenkins	Chatham
WASHINGTON	C. J. Gould	Puyallup
WEST VIRGINIA	J. G. Leach	Morgantown
	C. F. Taylor	Kearneysville
WISCONSIN	P. E. Hoppe	Madison
	J. D. Moore	Madison
	J. C. Walker	Starks
CANADA		
BRITISH COLUMBIA	G. E. Woolliams	Kelowna
MANITOBA	J. E. Machacek	Fort Garry
	K. Schreiber	Fort Garry
NOVA SCOTIA	K. A. Harrison	Kentville
	J. F. Hockey	Kentville
	D. G. Ross	Kentville
ONTARIO	W. C. Broadfoot	Ottawa
	G. C. Chamberlain	St. Catherines
	A. M. Leach	Ottawa
	J. Martin	Ottawa
	Ruth Mackay	Ottawa
	J. K. Richardson	St. Catherines
	A. J. Skolko	Ottawa

State or Province	Cooperators	Place
PRINCE EDWARD ISLAND	L. C. Callbeck	Charlottetown
SASKATCHEWAN	R. C. Russell	Saskatoon
MEXICO	J. S. Niederhauser	Chapingo

Some reports were received too late to be included in the summaries.

SOURCES OF CHEMICALS TESTED

Berk and Company
Commonwealth House, 1-19
New Oxford Street
London, England

F. W. Berk and Company
Wood-Ridge, New Jersey

California Spray Chemical Corporation
Elizabeth, New Jersey, or Richmond, California

Canadian Industries Ltd.
Box 10
Montreal, Canada

Carbide and Carbon Chemical Corporation
30 East 42nd Street
New York 17, New York

Central Chemical Corporation
Hagerstown, Maryland

Chipman Chemical Company
Bound Brook, New Jersey

Dominion Rubber Company
Metcalf Street
Guelph, Ontario

Dow Chemical Company
Midland, Michigan

E. I. Du Pont de Nemours and Company
Du Pont Building
Wilmington 98, Delaware

Gallohur Chemical Corporation
801 Second Avenue
New York 6, New York

General Chemical Company
40 Rector Street
New York, New York

Givaudan-Delawanna, Inc.
330 West 42nd Street
New York 18, New York

B. F. Goodrich Chemical Company
324 Rose Building
Cleveland 15, Ohio

Green Cross Insecticides
2875 Centre Street
Montreal, P, Q,

Harshaw Chemical Co.
1945 East 97th Street
Cleveland, Ohio

Imperial Chemical Industries, Ltd.
Hexagon House Blackley
Manchester, England

Innis, Speiden and Company
117 Liberty Street
New York 6, New York

Mallinckrodt Chemical Works
2nd and Mallinckrodt Streets
St. Louis, Missouri

Merck and Company, Inc.
Rahway, New Jersey

Michigan Chemical Company
St. Louis, Michigan

Micronizer Processing Company
Moorestown, New Jersey

Monsanto Chemical Company
1700 South 2nd Street
St. Louis 4, Missouri

Niagara Sprayer and Chemical Company
Middleport, New York

Onyx Oil and Chemical Company
15 Exchange Place
Jersey City 2, New Jersey

Panogen, Inc.
117 Hudson Street
New York, New York

R. J. Prentiss Company
80 John Street
New York, New York

Rohm and Haas Company
222 W. Washington Square
Philadelphia 5, Pennsylvania

Shell Chemical Corporation
100 Bush Street
San Francisco 6, California, or
50 W. 50th Street
New York 20, New York

The Sherwin-Williams Company
101 Prospect Avenue, N.W.
Cleveland, Ohio

Standard Agricultural Chemicals, Inc.
1308 Adams Street
Hoboken, New Jersey

Standard Oil Company (Indiana)
910 South Michigan Ave.
Chicago 80, Illinois

Stauffer Chemical Co.
420 Lexington Ave.
New York 17, New York, or
636 California Street
San Francisco 8, California

Tennessee Corporation
621 Grant Building
Atlanta 1, Georgia

United States Rubber Co.
Naugatuck Chemical Division
1230 Sixth Avenue
New York 20, New York

R. T. Vanderbilt Company, Inc.
230 Park Avenue
New York 17, New York

Westvaco Chlorine Products Corporation
405 Lexington Avenue
New York 17, New York

FUNGICIDES USED IN 1948

Trade Name	Active Principle	Source
Agrosan 9-N	ethyl mercury chloride + phenyl mercury acetate	Imperial Chemicals
A G 1609 B		General Chemicals
Arasan	tetramethyl thiuram disulfide	DuPont
Arasan SF	tetramethyl thiuram disulfide	DuPont
Arathane (Cr. 1639)	dinitro caprylphenyl crotonate	Rohm and Haas
Bismuth subsalicylate	bismuth subsalicylate	Monsanto
Bioquin 1	copper 8-quinolinolate	Monsanto
Bioquin 50-W	copper 8-quinolinolate	Monsanto
Bioquin 75	75% copper 8-quinolinolate	Monsanto
Bordeaux mixture	copper basic sulfates (calcium)	Homemade
Bordow	copper basic sulfates (magnesium)	Dow
Calo Chlor		Mallinckrodt
Calogree	mercuric chloride	Mallinckrodt
Carbide and Carbon 169	chromate complex	Carbide & Carbon
" " " 531	" "	" "
" " " 640	" "	" "
" " " 658	" "	" "
Carbamate H. L. -275		Calif. Spray
Cd A	inorgano Cd (20% active)	
Cd B	organo Cd (20% active)	
Cd C	organo Cd (20% active)	
Ceresan 2%	ethyl mercury chloride	DuPont
Ceresan, New Improved	" " " phosphate	DuPont
Ceresan M	ethyl mercury p-toluene sulfonanilide	DuPont
C.O.C.S.	copper oxychloride sulfate	Harshaw
Compound 163	mixture of glyoxalidines	Carbide and Carbon
Compound 341 A	" "	" "
Compound 341 B	" "	" "

Trade Name	Active Principle	Source
Compound 341 C	mixture of glyoxalidines	Carbide and Carbon
Compound 531	" "	" "
Copper A Comp.	copper oxychloride	DuPont
Copper Carbonate	-----	Rohm & Haas
Copper Hydro 40	copper hydroxide	Chipman
Copper Lime Dust	copper sulfate and lime	Various
Copper quinolinolate	copper 8-hydroxyquinoline sulfate	Monsanto
Copper zinc-chromate (658)	chromate complex	Carbide & Carbon
Copper zinc-oxide	copper oxide & zinc oxide	-----
Cornell Silver Spray	silver nitrate-ferrous sulfate-lime	Homemade
Cuprocide	cuprous oxide	Rohm & Haas
D-D	dichloropropene-dichloropropane	Shell
Deecop	-----	Canadian Industries
Dithane	di-sodium ethylene bis dithiocarbamate	Rohm & Haas
Dithane cadmium	cadmium ethylene bis dithiocarbamate	" "
Dithane calcium	calcium ethylene bis dithiocarbamate	" "
Dithane D-14	di-sodium ethylene bis dithiocarbamate	" "
Dithane ferric	ferric ethylene bis dithiocarbamate	" "
Dithane magnesium	magnesium ethylene bis dithiocarbamate	" "
Dithane manganese	manganese ethylene " "	" "
Dithane zinc	zinc ethylene bis dithiocarbamate	" "
Dithane Z-78	" " " "	" "
Dithane 5880	-----	" "
DN-111	dinitro organic	Dow
Dowfume G	methyl bromide	"
Dowfume N	dichloropropene-dichloropropane	"
Dowfume W-10	ethylene dibromide	"
Dowfume W-40	" "	"
Dowicide B	sodium salt of 2,4,5-trichlorophenol	"
Dowicide C	sodium chloro-2-phenylphenate	"
Dow Rose Dust	sulfur, copper and lead arsenate	"

Trade Name	Active Principle	Source

Trade Name	Active Principle	Source
Dow 9B	zinc trichlorophenate	Dow
Dow F-800	50% trichlorophenyl monochloro acetate	"
Dry lime-sulfur	calcium polysulfides	Sherwin-Williams
DuBay 1230BS	-----	DuPont
Elgetol	sodium dinitro cresolate	Standard Agricultural Chemicals
Everett Flotation sulfur paste	by-products sulfur	-----
Fermate	ferric dimethyl dithiocarbamate	DuPont
Fermate Rose Dust	8.75% Fermate and 84.87% sulfur	"
Flotation sulfur paste	by-product sulfur	Various
"Flo-sul 70" sulfur paste	by-product sulfur	Central Chem.
Formaldehyde	-----	Various
G 4	dihydroxy dichloro diphenyl methane	Givaudan-Delawanna
G. C. 308	copper nitrodithioacetate	General Chem.
G. C. 629	zinc nitrodithioacetate	" "
Geon latex 31	geon polyvinyl chloride latex	Goodrich
GG	organo Cd-Hg (2.4% Hg., 6.0% Cd)	-----
Glyoxalidine 341 A	mixture of glyoxalidines	Carbide and Carbon
" 341 C	mixture of glyoxalidines	" "
Goodrite P.E.P.S. (Omlite)	polyethylene polysulfides	Goodrich
Goodrite Z.A.C.	zinc dimethyl dithiocarbamate	DuPont
General 308	66% copper nitrodithioacetate	-----
General 629	66% zinc nitrodithioacetate	-----
General Cu (93-22)	copper ammonium salt	-----
H 258 D	organo Cd (20% active)	Merck
HL 225	-----	Calif. Spray
HL 331	phenyl mercury acetate	Calif. Spray

Trade Name	Active Principle	Source
IN 10425 (liquid)	manganese ethylene bis dithiocarbamate	DuPont
IN 10425 (powder)	manganese ethylene bis dithiocarbamate	"
Isothan DL-1	-----	Onyx Oil & Chem.
Iscobrome	methyl bromide	Innis, Speiden
Iscobrome D	ethylene dibromide	" "
Karbam black	ferric dimethyl dithiocarbamate	Sherwin-Williams
Karbam white	zinc dimethyl dithiocarbamate	" "
Kolofog	bentonite sulfur	Niagara Sprayer
Krenite	sodium dinitro cresolate	DuPont
Larvacide	chloropicrin	Innis, Speiden
Leytosal	2% mercury	Berk
Leytosan	7.2% phenyl mercury urea	"
Lime-sulfur	calcium polysulfides	Various
Lunasan	5% ethyl mercury thiourea	Berk
Lysol	50% tar acids + soaps	Various
Magnetic "70" paste	sulfur paste	Stauffer
Magnetic "95" sulfur	finely ground sulfur	"
Manganese ethylene bis dithiocarbamate	manganese ethylene bis dithiocarbamate	DuPont
Manganese, zinc, copper dust	manganese, zinc, copper sulfates	
Merck H-520		Merck
Merck 258A	20% cadmium organic salt	"
Merck 258C	" " " "	"
Mersolite 8	phenyl mercuric acetate	F. W. Berk
Mersolite P	2% phenyl mercuric acetate in Bentonite	"
Mercuric chloride	mercuric chloride	Various
Mercurated lead arsenate	combination of mercury and lead arsenate	
Methasan	zinc dimethyl dithiocarbamate	Monsanto
Microflotox sulfur	finely ground sulfur	Calif. Spray

Trade Name	Active Principle	Source
Microgel	tribasic copper sulfate	Tennessee Corp.
Micronized sulfur	micronized sulfur	Micronizer Processing
Mike sulfur	" "	Dow
Monocop dust	monohydrate copper sulfate	Various
M.T.H.	75% nitroso phthalimidine	Dominion Rubber
Mulsoid Sulfur	finely ground sulfur	Sherwin-Williams
Mycotox	2,4,5 trichlorophenyl	
Panogen	methyl mercury di cyan diamide	Panogen, Inc.
Parzate	zinc ethylene bisdithiocarbamate	DuPont
Parzate Liquid (Na)	sodium " "	"
Parzate Liquid (Ca)	calcium " "	"
Peps	polyethylene polysulfide	Goodrich
Perenox	copper oxychloride	Canadian Industries
Phenyl mercury acetate	phenyl mercury acetate in bentonite	F. V. Berk
Phenyl mercury fixtan	phenyl mercury hydroxide + naphthalene sulfonic acid	Imperial Chemicals
Phygon	dichloronaphthoquinone	U. S. Rubber
Phygon (wettable)	"	"
Phygon XL	"	"
Phygon XLCS	calcium sulfate safener added to Phygon	"
Phygon XLMS	magnesium " " " " "	"
Puratized Agricultural Spray	phenyl mercury triethanol ammonium lactate	Gallohur, Niagara
Puratized B	phenyl mercury monoethanol ammonium acetate	Gallohur
Puratized 111-5	organic (4% Hg - 4% Cu)	"
Puratized FS - 33	100% substituted ammonium salt	"
Puratized SPC	100% phenyl mercury salt	"
Puraturf 177	phenyl amino cadmium lactate	"
R-118A	mercury	Green Cross Insectide
R1078 x 67	same as Agrosan with 5% mercury	Imperial Chemicals
R1078 x 73	6% phenyl mercury acetate	Imperial Chemicals
R-1856	-----	Niagara Sprayer

Trade Name	Active Principle	Source
7R2312	organic Cd (20% active)	Merck
RE 358	dimetacresyl trichloroethane	Calif. Spray
Rose Dust	sulfur, copper, rotenone, and DDT	Michigan Chem.
Rosineamine-silver nitrate	rosineamine-silver nitrate	
S. C. R. 21 770	50% ethyl carbonate trichlorophenol	-----
Salicylic acid	salicylic acid	Various
Seedox	50% trichlorophenyl acetate	R. J. Prentiss
Semesan	30% hydroxymercury chlorophenol	DuPont
Semesan, Jr.	ethyl mercury phosphate	DuPont
Silver nitrate	silver nitrate	Various
Soilfume 80-20	ethylene dibromide	Westvaco
Spergon	tetrachlorobenzoquinone	U. S. Rubber
Spergon (Wettable)	tetrachlorobenzoquinone	U. S. Rubber
Standard Oil 408	-----	Standard Oil
Standen #307	2,4,5 trichlorophenyl acetate	-----
Stauffer 411 dust	-----	Stauffer Chem.
Sulfur	finely ground sulfur	Various
Sulfur dust	finely ground sulfur	Various
Sulfuron	micronized sulfur	DuPont
Sulphuron X	-----	DuPont
Tennessee Copper 26	copper basic sulfate	Tennessee Corp.
Tennessee Copper 34	copper basic sulfate	Tennessee Corp.
Tersan	tetramethyl thiuram disulfide	DuPont
Tribasic copper sulfate	copper basic sulfate	-----
Yellow Cuprocide	yellow cuprous oxide	Rohm and Haas
Z.78	zinc ethylene bis dithiocarbamate	Rohm and Haas
Z.A.C.	zinc dimethyl dithiocarbamate cyclohexylamine	-----

Trade Name	Active Principle	Source
Zerlate	zinc dimethyl dithiocarbamate	DuPont
Zinc Copper Bordeaux	zinc and copper basic sulfate	Homemade
Zinc Hg chromate	zinc 40%, Hg 15%, chromium 40%	Carbide and Carbon
Zinc sulfate lime	basic zinc sulfate	Homemade

RESULTS WITH FRUIT DISEASES

APPLES

Reports were received from Colorado, Illinois, Iowa, Indiana, Kansas, Maine, Massachusetts, Missouri, Nebraska, New Jersey, New York, New Hampshire, North Carolina, Nova Scotia, Ohio, Ontario, Oregon, Pennsylvania, Rhode Island, Virginia and West Virginia.

SCAB

The reports submitted in 1948 indicated a light to moderate infection in the eastern, New England and Canadian sections. In the Atlantic Coast States infection was most severe in Virginia, Maryland, Delaware, and New Jersey. In Pennsylvania and New York and in the middle States initial infection was heavy but dry weather during the late spring and summer held down secondary infection. From nearly all the reports received it appeared that the materials used this year were subjected to good tests. Several very warm periods in the summer caused scald of leaves and fruits in many of the States.

Phygon, Fermate, Puratized Agricultural Spray, 341-C, Bioquin 1 (50 W) manganese ethylene bis dithiocarbamate, micronized sulfur, flotation pastes and Magnetic "70" paste were used most frequently by the investigators. Lime-sulfur, Cr. 1639, Goodrite Z-A-C, wettable sulfur, mike sulfur, microflotox, 341 B, magnetic "95", Flo-sul paste, Stanofide, Krenite, DN-111, Bordeaux mixture, mulsoid sulfur, Sulfuron, Karbam black, Goodrite p.e.p.s., Parzate, Z.78, G.L.F.#4, Dithane, mercurated lead arsenate, General 629, General 308, General Cu (93-22), Merck 258A, Merck 258C, Puratized 111-5, Puratized FS-33, Puratized SPC, and Puratized B were used occasionally.

Combination sprays consisting of Phygon-sulfur, Phygon-Fermate, Puratized-Fermate, Puratized-micronized sulfur, Puratized-mike sulfur, Puratized-Phygon, Puratized-Bioquin 1, Fermate-manganese carbamate, sulfur-manganese carbamate, HL 331-micronized sulfur, Phygon-micronized sulfur, Parzate-micronized sulfur, Z.78-Micronized sulfur and Karbam black-micronized sulfur were used. Such mixtures appeared more frequently in the schedules this year than ever before. It is not certain, from the reports submitted, that such a practice has led to any particular advantage over the scab organism. Where controls have been used not much difference was observed. In general, such mixtures reflected the effect of the most potent of the constituents. Manganese ethylene bis dithiocarbamate appeared to be helped by the addition of sulfur and Fermate. With the others, combination sometimes helped and sometimes decreased their efficiency. With the mercury compounds, it is not certain that this is a good practice since reactions may occur to cut down the effective-

ness of these materials.

Spreaders and stickers, such as polyethylene polysulfide, Orthex and Graselli spreader-sticker were frequently used to fix the materials more firmly on the leaves and fruits or to reduce the quantities of spray materials used. Some benefit was noted in stepping up control with sulfurs and Fermate with this method. Lime was used occasionally with 341 C and calcium sulfate and magnesium sulfate were used with Phygon for safening purposes.

Phenyl mercury acetate (HL 331), 2,3-dichloro 1-4-napthoquinine (Phygon), glyoxaladine (341 c), ferric dimethyldithiocarbamate (Fermate, Karbam) and phenyl mercury triethanolammonium lactate (Puratized Agr. Spray) were consistently the best fungicides used during the 1948 season. The sulfur materials in general appeared to disadvantage during this season, and this no doubt reflects their inability to cope with the disease during a year when the fungus was most active. In only a few cases were they ranked among the best. Copper-8-hydroxyquinoline (Bioquin 1, Bioquin 50 W) performed erratically as a fungicide being, in some tests, among the best and in some cases, among the poorest of the performers. Parzate, Z.78, Goodrite p.e.p.s., Goodrite Z.A.C, Cr. 1639, Stanofide, and mercurated lead arsenate behaved poorly during the season.

Considering the results from the plant injury side of the picture it appears beyond question that Phygon is not, as yet, able to take its place among our apple fungicides. The material causes too much foliage and fruit injury and was responsible for reducing the size of the fruit, premature thinning (drops) and, apparently, alternate bearing in some cases. Corrective measures also failed to eliminate the dermatitis which is sometimes experienced with this compound. Glyoxalidine 341 c appeared to be unfavorable to plant tissue in some of the tests. In Illinois, Pennsylvania, and Nova Scotia the material apparently weathered the season without causing leaf or fruit injury. In Indiana leaf spotting but no fruit russet was observed. In New Jersey, New York, Ontario, and Virginia fruit russeting was common when this material was used. West Virginia reported a change in the color of the leaves while Ohio reported it as being injurious to both leaves and fruit. In New York one report indicated that fruits sprayed with this compound scalded during hot weather. Lime was sometimes added as a safener to 341 c but the results do not indicate that this was wholly effective.

Puratized Agricultural Spray when not mixed with lime or not used late in the cover sprays failed to cause any leaf or fruit injury. When used in the late covers, one State reported leaf yellowing. Where lime was added to such a material some injury was noted in New York State. It was also noticed that additions of lead arsenate also caused deleterious changes to take place.

HL 331 (Phenylmercury acetate) was only observed to cause any signs of leaf injury when lime or lead arsenate were added to the compound. Some leaf yellowing developed in these cases. This was also true of Puratized B (Phenyl mercury monoethanol ammonium acetate).

Fermate again performed very well from a plant injury standpoint. When mixed with Phygon it appeared to increase the injury caused by Phygon but in every other case it gave good foliage, good fruit finish and appeared to increase fruit size and crop.

Bioquin 1 (50 W), Puratized FS 33, Puratized 111-5, General #308, General #629, General Cu (93-22), Parzate, Cr. 1639, Z.78, and lime sulfur, all caused appreciable injury to leaves and fruits and all the sulfur materials were responsible for varying leaf and fruit injuries. Manganese carbamate was observed as causing excessive fruit drop in New York and some fruit injury in Illinois.

RUST

One rust experiment was described from Virginia. Phygon, Compound 341, Puratized Agricultural Spray, HL 331, Bioquin 1, Manganese carbamate and Fermate were used on York and Jonathan varieties. Fermate proved to be the best for rust. Phygon, Bioquin 1, 341, Manganese carbamate, and the mercury materials proved to be not useful.

BITTER ROT

Phygon XL, Fermate, Bioquin 50W, a mixed schedule of Puratized Agricultural Spray and Zerlate, and a mixed schedule of dry lime-sulphur and bordeaux, were effective in North Caroline. Wettable sulfur was ineffective and caused early defoliation. Bioquin 50W and the lime-sulfur-bordeaux schedule caused some fruit russet and leaf injury.

BLOTCH

Nebraska reported one test on the Duchess variety. Lime sulfur in petal fall followed by bordeaux on 5 cover sprays was equal to Fermate used in petal fall and covers as to disease control. Fermate was superior as far as safety was concerned.

FIRE BLIGHT

Two applications of Dithane Z-78, one at 10% full bloom and one at full bloom gave good control in Colorado. Two applications of zinc sulfate or one application of Dithane Z-78 at 10% bloom gave fair control. One application of zinc sulfate at 10% bloom gave very poor control.

MILDEW

Powdery mildew appears again to be a problem in the Pacific Northwest. One test was reported on from Oregon where mildew was found attacking the Ortley variety. Fermate, Puratized Agricultural Spray, DN-111, Krenite, 341 C, Dry lime-sulfur-wettable sulfur (split schedule) and Cr. 1639 (Arathane) were used in the pink and calyx stages of growth. The standard materials, dry lime-sulfur and wettable sulfur proved to be the best, being considerably more effective than the next best (Cr. 1639) material. Puratized Agricultural Spray, DN-111, Krenite, Fermate, and 341c proved to be ineffective in controlling the disease.

PEARS

FRUIT ROTS

In one test described from Oregon, a Dowicide C wash was used in comparison to an acid wash to control fruit rotting. The fruit was dipped for 3 to 5 minutes and then rinsed before packing. Such a procedure reduced the rot from 5.9% in the check to 1.8% in the treatment with Dowicide C. The use of such a material requires good ventilation in the sorting and packing rooms to avoid irritation from the vapors from the material.

FIRE BLIGHT

Two applications of Dithane Z-78, one at 10% full bloom and one at full bloom, gave good control, or one application at full bloom gave fair control in Colorado. Poor control was obtained with Puratized Agricultural Spray, PAS, and zinc sulfate.

CHERRIES

LEAFSPOT

One report on leaf spot was sent in from Nebraska where a variety of sour cherries were sprayed with lime-sulfur-bordeaux mixture (split schedule), Fermate, 341B and Phygon on one test and without Phygon in another test. The materials were used at petal fall, 2 covers and one post-harvest in a four spray schedule. In the first test all of the materials performed well in holding the fungus while in the other none of the materials proved effective. This difference was attributed to the failure of getting a good coverage in the second test, a test in which a spray mast was used for application. In the lime-sulfur-bordeaux mixture plots early leaf fall was experienced. No yield data was obtained.

In Ontario sweet cherries were sprayed with Fermate, Compound 341B, Phygon XL and C.C.C.S. plus lime. Only one application at post-harvest

was made. Under these conditions Fermate proved to be the best and the copper material caused some leaf yellowing.

BROWN ROT

Two tests were submitted from Oregon. In one test an application of Krenite, 3 pints in 100 gallons of spray fluid, was applied at the rate of 15 gallons to a tree at the pop-corn or pre-bloom stage of growth. This material killed about 60% of the bloom but at harvest time a larger and cleaner yield of fruit was harvested from the Krenite treated trees. Blossom blight was reduced from 84% in the untreated trees to 8% in the treated trees. No doubt some of this reduction can be traced to blossom elimination by the treatment. In another test in Oregon bordeaux mixture, Phygon (2 strengths) sulfur, Zerlate, Fermate, Parzate, Z.78, 341B, and Puratized Agricultural Spray were applied at early pop-corn, early bloom and late bloom periods. Bordeaux was the only material that appeared to cause injury. In this case the pistils, stamens and petals of the blooms were observed as being blasted. Puratized, Phygon and 341B all proved about equal and best in controlling the disease while bordeaux mixture, Parzate and Z.78 were considered as being not worthy of further trials. Phygon was apparently responsible for increasing the yield.

PEACHES

BROWN ROT

The disease, from all sources of information, was very severe on peaches in all of the northern peach growing States and especially so in Virginia, Delaware, Maryland, and New Jersey during 1948. Experiments were reported on from South Carolina, North Carolina and Delaware. Two tests showed the effect of controlling blossom blight on fruit rot at harvest time and several were developed to show the effect of spraying during the pre-harvest period on the disease at harvest time.

In the two blossom experiments Phygon, Fermate, dilute lime sulfur, and sulfur were compared. In both tests the incidence of blossom blight was low. Significant reductions, by the treatments, in the amount of blossom blight resulted in a decrease in fruit rot at harvest time. In the tests where sprays were compared for the control of fruit rot at harvest time quite a few materials were used. In one test in Delaware, Sulfuron, Zerlate, Fermate, Parzate, Parzate-Zerlate, Bioquin 1, Phygon, and self-boiled lime-sulfur were used throughout the season. The last mixture proved to be the best but was not significantly better than Sulfuron, Fermate, Parzate or mixtures of these with lime or with each other. Phygon and Bioquin 1 were distinctly inferior to the above. In a strictly pre-harvest experiment in Delaware where fungicides were used just prior to harvest, sulfur, lime-sulfur, Dithane, Parzate, Zerlate, and Bioquin 1 were compared. The lime-sulfur was used at varying dilutions and in com-

bination with stickers and with Dithane and also zinc lime. All of the other materials were used with a sticker. The results indicated at harvest time that the Bioquin 1 plot had the lowest percentage of rot and the Parzate plot was next best. Poor control was obtained with the other materials. Foliage injury was observed in the lime-sulfur, Dithane, and Parzate plots. On the Dithane treated trees this was severe. In a similar test at Bridgeville and Rising Sun, Delaware, no significant differences could be observed in the control of fruit rot by applications of sulfur, Bioquin 1, or liquid lime-sulfur.

Pre-harvest applications of Phygon and dry lime-sulfur were effective in North Carolina following wettable sulfur-zinc-lime-arsenic applications but considerable arsenical injury developed in the Phygon plots. Wettable sulfur was less effective and Zerlate gave poor control.

BACTERIAL SPOT

Two reports were received from New Jersey. In one the tests cover a period of three years in which over 20 compounds have been used to control the bacterium that causes this disease. Of the many materials used zinc sulfate-lime, Delmo-Z-lime, copper-8-quinolinolate-lime and Tennessee copper-26 have given the best control of the disease on the fruits. Sulfur, dithiocarbamates, Phygon, and Glyoxalidine 341B gave no protection. Where the zinc-lime spray was used, in this State, a great deal of leaf injury and subsequent defoliation occurred. This effect appears to be peculiar to New Jersey. In the other test covering two years of experiments, the zinc-lime spray and Tennessee copper-26 proved the best for control in 1947, but in 1948 neither were very efficient. Phygon, zinc-8-quinolinolate, and sulfur failed to have any effect in controlling this disease.

SCAB

Two to four pre-harvest applications of Phygon, dry lime-sulfur, wettable sulfur and Zerlate following sulfur-zinc-lime-arsenic applications were equally effective in controlling scab in North Carolina. Arsenical injury was increased by the Phygon and the Zerlate applications. Much less arsenical injury occurred when only two Zerlate applications were made than when three or four were made.

LEAF CURL

Experiments to control this disease were set up in Oregon during 1948. In one test in the Willamette Valley bordeaux mixture, Zerlate, Phygon, and liquid lime-sulfur were used during the January dormant period. All four materials gave good commercial control but bordeaux mixture proved to be the poorest of the lot. Liquid lime-sulfur, however, caused a lot of bud killing but at harvest time all treatments gave about an equal crop of fruits.

APRICOTS

BROWN ROT

In one test near Hollister, California, Fermate and bordeaux mixture were applied as sprays at the full bloom and at the petal fall stages of blossom development to control twig blight. The untreated trees showed 32 percent twig blight while Fermate and bordeaux mixture reduced this to 6 and 15 percent, respectively, when applied at full bloom stage. When Fermate was applied only in petal fall, 20 percent of the twigs were infected but when applied at full bloom and petal fall only 1 percent of twig blight occurred.

JACKET ROT

In this disease, where the attack usually takes place when the small fruits still have their calyxes attached to them, Fermate was used at full bloom, at petal fall, and both at full bloom and petal fall. In the untreated trees the percentage of jacket rot was found to be rather low and amounted to only 7 percent. Treatment at full bloom and petal fall reduced this figure to 1 percent. Two percent developed when only a petal fall application was made while a full bloom spray reduced it to 3 percent.

GRAPES

BLACK ROT

One report was received from Florida and two from Missouri concerning this disease. Compound 658, 341-c, Z.78, and Tennessee copper-26 were used in the Florida test. Since the amount of disease that developed was of minor importance nothing was discovered concerning the relative values of the four materials used. Z.78 caused the least discoloration of the fruit. In Missouri at Rosate, a five application schedule with Karbam Black, Fermate, Dithane-zinc-lime, and Fermate plus Phygon was used. Fermate plus Phygon (1-1/3-100) gave the best control but the berries were russeted by Phygon. Either Fermate or Karbam black were next best in control and neither caused any injury. At Columbia, Missouri, Fermate, bordeaux mixture and Stanofide were compared and Fermate proved to be the best. Stanofide and bordeaux mixture caused stunting and Stanofide curled the grape leaves. Considering the work done during the season in the various vineyards in Missouri, the cooperator indicated that Fermate and Karbam black are rated the best materials for controlling black rot.

DOWNY MILDEW

Bordeaux mixture (2 concentrations), Bordow and Phygon XL were compared

in Ontario for control. The two concentrations of bordeaux mixture used were also compared when mixed with stickers (Orthex and P.E.P.S.). The disease was quite severe on untreated vines, averaging about 75 percent infection. After applications were made at pre-bloom, fruit set and 2 weeks later, the disease was controlled best by a bordeaux mixture, without sticker, consisting of 7.5 pounds of copper sulfate and 10 pounds of hydrated lime in 100 gallons of water. Phygon gave the poorest control. The addition of stickers to bordeaux mixture lowered its efficiency considerably. The efficiency of Bordow was about equal to the weaker bordeaux mixture containing the stickers. Bordow apparently was the only copper material used that did not cause leaf scorch. Phygon caused fruit russet and chlorosis. Apparently the most important application was at the pre-bloom period.

CRANBERRIES

FRUIT ROTS

Control of fruit rots caused by Guignardia and Acanthorynchus was studied in New Jersey. Fermate, Zerlate, and Parzate were used. Fruit rot was not high in the unsprayed checks, being 26.6%, and all of the dithiocarbamates behaved about the same in bringing the disease down to around 10%. All of the materials were used at the rate of 3 pounds to 100 gallons and 250 gallons of spray were used per acre of cranberries.

RASPBERRY

ANTHRACNOSE AND SPUR BLIGHT

At St. Catherines, Ontario one delayed dormant application of Krenite and two summer applications of Fermate, Fermate plus P.E.P.S., Phygon, and Phygon plus P.E.P.S. were used to control the two diseases. Phygon was found to be the best material for the control of both diseases. Apparently the additions of the sticker failed to augment control. Phygon was observed to cause a slight russeting of the canes, but this was not important.

YELLOW RUST

A single early season application of Elgetol, Phygon, Fermate, lime-sulfur and a combination of Tribasic copper sulfate-zinc sulfate was applied to Cuthbert and Washington red raspberry plants and to the adjacent soil cover in Oregon to control this disease. 300 gallons of Elgetol and 200 gallons of the other materials were used per acre. Good control of early summer infections were obtained through the use of Elgetol 2 qts.-100, Phygon 2-100, Fermate 2-100, and lime-sulfur 4-100. No injury developed in any plot.

STRAWBERRY

FRUIT ROTS

In Tennessee CR 1639 at a concentration of 1/3 lb. of the active ingredient in 100 gal. and Mycotox dust (0.5 and 1.0%) caused injury. CR 1639 at 1/8 lb. active in 100 gal. and G-4 (up to 16% dust) did not cause injury. There was insufficient rot to evaluate disease control.

CITRUS

LEMON BROWN ROT

Lemon fruits were treated with a large number of chemicals in one test in California for the control of the Phytophthora brown rot disease. In some cases the materials were applied as sprays while in others the lemons were dipped in suspensions of the compounds in water. Significant and large reductions in diseased fruits were obtained by using ferric ethylene bis dithiocarbamate, Carbide and Carbon numbers 169, 531, 640, and 658 (complex chromates), Cr. 1639 (Arathane), homemade bordeaux 1-1-100, Phygon XLMS, zinc-copper-bordeaux mixture 5-1-4-100, California Spray number RE358, magnesium ethylene bis dithiocarbamate, Goodrite zinc dithiocarbamate-cyclohexylamine complex, G4, and a silver nitrate-lime mixture 1/16-1/16-100. Of these compounds Phygon XLMS produced a non-removable stain on the lemon fruits.

RESULTS WITH VEGETABLE DISEASES

Wherever possible, results have been presented by placing the materials in groups of approximately equal control or yield. Injury data are listed as reported by the cooperator. No entirely new organic compound was reported, but several variations of old ones appeared. Dithane Z-78 and Parzate were tested more widely than in 1947; the same is true for Zac, Copper-Zinc-Chromate (658), and Manganese ethylene bisdithiocarbamate (IN-10425). Tank-mix combinations of Zerlate-Parzate, etc., received further testing, and even tank-mixes of Zerlate and Fixed Coppers were reported. Alternating schedules continued to be tested on tomatoes, and split schedules of a dithiocarbamate and Bordeaux appeared more frequently than in 1947. (3-4) appearing after a split schedule indicates number of applications of each.

Dithane D-14 and Liquid Parzate were used with the addition of zinc sulfate only; they are listed in the text as Dithane D-14 and Liquid Parzate. Wherever Zerlate-Parzate appears, or Zerlate-Tribasic, it means a tank-mix; when the ratio of materials is known it is indicated, e. g., (1-1).

In practically all tests on potatoes, DDT was used in combination with the fungicides.

Dust tests are so indicated; all others are spray tests.

POTATOES

LATE BLIGHT

MEXICO (Campo Experimental Station, Chapingo): Descending control order was: (1) Bordeaux; (2) Copper A Compound, COCS; (3) Zerlate; (4) DDT. Bordeaux mixture caused slight stunting and tip burn. Descending yield order was: (1) Copper A Compound, COCS; (2) Bordeaux; (3) Zerlate; (4) DDT. Cooperator's note: "Zerlate is no good for blight control".

FLORIDA (Homestead): Descending control order was: (1) Dithane D-14; (2) Parzate; (3) Copper Hydro 40, Bordeaux, Cuprocide, Tribasic; (3) Copper-Zinc-Chromate; Copper A Compound, HL 275, General Chemical 629 plus 308. Injury: Cuprocide, Bordeaux, and Copper-Zinc-Chromate caused slight stunting. Descending yield order was: (1) Dithane D-14; (2) Parzate; (3) Tribasic, Copper Hydro 40, Cuprocide, Bordeaux, Copper A Compound; (4) Copper-Zinc-Chromate, HL 275, General Chemical 629-308; (5) Untreated. Over-all preference covering 1 to 10 years of research: (1) Dithane D-14; (2) Parzate; (3) Copper A Compound, Tribasic, Cuprocide, Copper Hydro 40; (4) Bordeaux; (5) Copper-Zinc-Chromate; (6) HL 275; (7) General Chemical 629-308. Copperator's note: "Copper-Zinc-

Chromate (658), HL 275 (a Zn carbamate), and Gen. Chemical 629-308 (a mixture of copper and zinc nitro dithioacetates) not worthy of further trial under our conditions."

NEW JERSEY: Descending control order was : (1) COCS, Bordeaux; (2) Tribasic, Copper-Zinc-Chromate, Parzate, 406; (3) Dithane D-14; (4) Zerlate; (5) Untreated. No injury observed. Dithane D-14 gave the highest yield of any fungicide but differences in yield were not significant over that of the Untreated. No one material received preferential rating. Cooperator's note; "Zerlate not worthy of further trial."

PRINCE EDWARD ISLAND: Descending control order was: (1) Phygon XL; Parzate; (3) Bordeaux, Bordow, COCS Nistox; (3) Deecop, Dithane D-14; (4) General Chemical 629, Untreated. Injury: Phygon XL delayed maturity. Descending yield order: (1) COCS Nistox, Bordow, Parzate; (2) Bordeaux; (3) Dithane D-14, Deecop, Phygon XL; (4) General Chemical 629; (5) Untreated. Over-all preferential rating in descending order: (1) Parzate; (2) COCS, Bordow; (3) Bordeaux; (4) Deecop, Dithane D-14. Cooperator's note: "Fungicide 629 absolutely failed to control blight under the severe conditions of the experiment and is not worthy of further trial. Outstanding disease control was shown by Phygon XL, but because it exhibited such a propensity to delay maturity it is expected that this fungicide would never be suitable in this Province."

RHODE ISLAND: Spray Concentrate Test. This test is not reported in detail. However, two of the compounds used (Puratized 111-5 and Procop 110 E) gave excellent control. Puratized 111-5 gave no injury and Procop 110 E caused some foliage injury. These two materials gave the highest yields. Cooperator's note: "Materials were compatible with DDT. Oil-soluble fungicides are less injurious and more effective when applied as emulsions rather than in oil alone as the carrier. Puratized 111-5 is a specific eradicant fungicide for late blight."

EARLY BLIGHT

MICHIGAN: Descending control order was: (1) Copper-Zinc-Chromate; (2) Zerlate, Cuprocide, Dithane D-14; (3) Parzate, Copper-Zinc Oxide, Copper-8-Quinolinolate; (4) Zinc Nitrodithioacetate, Copper-Zinc- Nitrodithioacetate, Dithane Z-78. No injury noted. Descending yield order was: (1) Zinc Nitrodithioacetate, Dithane D-14, Parzate; (2) Copper-Zinc Oxide, Zerlate, Dithane Z-78, Copper-Zinc-Nitrodithioacetate; (3) Copper-8-Quinolinolate, Copper-Zinc-Chromate; (4) Yellow Cuprocide.

In a dust test, Zerlate, Copper-Zinc-Chromate, Copper-8-Quinolinolate, Tribasic, Dithane Z-78, and Zinc Nitrodithioacetate all gave very good early blight control. Yield differences were not significant.

A series of demonstration tests was made in eight counties. Late Blight was present in only one test and Early Blight was present in all

the others but was not serious. Yield data only were presented. Analysis of this data (Bu./A) for the spray tests shows the following:

1. Seven tests -- Bordeaux, 467.6; Dithane Z-78, 478.9
2. Six tests -- Tribasic, 444.8; Bordeaux, 459.5; Dithane Z-78, 467.7
3. Two tests -- Bordeaux, 505.5; Dithane Z-78, 512.5; Dithane D-14, 552.5
4. One dust test -- Basicop, 444; Tribasic, 432; Dithane Z-78, 402

WISCONSIN: Descending control order: (1) Dithane D-14, Parzate, Copper-Zinc-Chromate; (2) Tribasic, Zerlate, COCS; (3) Bordeaux; (4) Untreated. No injury noted. Yield in descending order was: (1) Dithane D-14, Parzate; (2) Copper- Zinc Chromate; (3) Zerlate, Tribasic, COCS; (4) Bordeaux; (5) Untreated. Over-all preferential rating is as above yield order.

CALIFORNIA: Spray and dust test. Descending control order was: (1) Parzate spray, 74% control; (2) Zerlate dust, 25% control; (3) Untreated, no control. No yield data presented.

DELAWARE: Test No. 1. Descending control order was: (1) Dithane D-14; (2) Dithane Z-78, Parzate, Manganese ethylene bisdithiocarbamate, Zerlate-Parzate (1-1); (3) Bordeaux, Zac; (4) Zerlate, Tribasic; (5) Untreated. No injury noted. Descending yield order was: (1) Dithane D-14; (2) Parzate, Zac, Manganese ethylene bisdithiocarbamate; (3) Zerlate, Dithane Z-78; (4) Zerlate-Parzate (1-1), Tribasic, Bordeaux; (5) Untreated.

Test No. 2. Descending control order was: (1) Dithane D-14, Liquid Parzate; (2) Yellow Cuprocide, Bordeaux; (3) Copper-Zinc-Chromate (658), Copper A Compound; (4) General Chemical 629, 308, and 629-308; (5) Untreated. Descending yield order was (1) Dithane D-14, Liquid Parzate; (2) Copper-Zinc-Chromate, Bordeaux; (3) Yellow Cuprocide; (4) G.C. 308 and 629-308; (5) Copper A Compound, G.C. 629; (6) Untreated.

TENNESSEE: No control data presented. No injury observed. Descending yield order was: (1) Bordeaux, Untreated; (2) COCS, Parzate, Tribasic, Cuprocide dust; (3) Dithane D-14, Copper A Compound. The Copper A Compound was significantly lower than Bordeaux.

LATE BLIGHT AND EARLY BLIGHT

ALABAMA: Spray and dust test. Descending control order was: (1) Dithane D-14, Phygon; (2) Dithane Z-78 dust, Parzate dust, Neutral Copper dust; (3) C.C. dust; (4) Untreated. Injury: Copper dust stunts plants and Phygon spray delays maturity. Descending yield order was: (1) Dithane D-14, Dithane Z-78 (6%) dust, Neutral Copper dust, Parzate;

(2) G.C. dust, Dithane Z-78 (3.9%) dust; (3) Phygon, Untreated. Over-all preferential rating: (1) Dithane D-14 spray; (2) Parzate spray and Dithane Z-78 (6%) dust.

IOWA: Descending control order was: (1) Dithane D-14, Parzate, Copper-Zinc-Chromate, Manganese ethylene bisdithiocarbamate; (2) Dithane Z-78, Tribasic, Bordeaux; (3) Zerlate; (4) Untreated. No injury noted. Descending yield order was: Dithane D-14, Parzate, Manganese ethylene bisdithiocarbamate, Tribasic; (2) Z-78, Copper-Zinc-Chromate, Zerlate; (3) Bordeaux; (4) Untreated.

OHIO (Wooster): Descending control order was: (1) 658, Parzate, Tribasic A, Dithane Z-78, Zerlate; (2) Tribasic, Zac; (3) 629; (4) Untreated. No injury noted. Descending yield order was: (1) Parzate; (2) Dithane Z-78, 658; (3) Zerlate, Tribasic A; (4) Zac, Tribasic, 629; (5) Untreated. Over-all preferential rating was: (1) Parzate; (2) Dithane Z-78, 658; (3) Zerlate, Tribasic A; (4) Tribasic, Zac, 629. Cooperator's note: "629 of questionable value."

OHIO (Marietta): Descending control order was: Tribasic A, Dithane Z-78, Tribasic; (2) Parzate, 658; (3) Zerlate; (4) 629, Zac; (5) Untreated. No injury of consequence. Descending yield order was: (1) Parzate; (2) Dithane Z-78; (3) Zerlate; (4) Tribasic A, Tribasic; (5) 658; (6) Zac; (7) 629; (8) Untreated. Cooperator's note: "629 of questionable value."

MINNESOTA: Test No. 1. Descending control order was: (1) Bordeaux; (2) Parzate, Copper-Zinc-Chromate, Dithane Z-78; (3) Tribasic, COCS; (4) Zerlate; (5) Untreated (DDT alone). No injury observed. Descending yield order was: (1) Dithane Z-78, Parzate, Zerlate; (2) Tribasic, Bordeaux, COCS, Copper-Zinc-Chromate, Untreated (DDT).

Test No. 2 (Dust.) Descending control order was: (1) Dithane Z-78; (2) Copper-Zinc-Chromate, COCS, Tribasic; (3) Parzate, Copper-Lime; (4) Zerlate; (5) Untreated (DDT). No injury of consequence. Descending order was: (1) Tribasic, Zerlate; (2) Dithane Z-78, Copper-Zinc-Chromate; (3) COCS, Parzate; (4) Untreated (DDT); (5) Copper-Lime.

RHODE ISLAND: Descending control order was: (1) Dithane Z-78; (2) General Chemical 629-308; (3) General Chemical 629; (4) Untreated. No injury reported. Descending yield order was: (1) Dithane Z-78; (2) General Chemical 629-308; (3) General Chemical 629; (4) Untreated. Over-all preferential rating: (1) Dithane Z-78. Cooperator's note: "The copper form (#308) is worth additional trial but I believe that the Zinc form (629) is not, under Rhode Island conditions."

MAINE: Descending control order for Early Blight was: (1) Dithane Z-78; (2) Dithane D-14, Bordeaux, Tribasic; (3) Copper-Zinc-Chromate, COCS; (4) Zerlate; (5) Parzate; (6) Untreated. Descending control order

for Late Blight was: (1) Bordeaux, Tribasic; (2) Dithane Z-78, COCS, Copper-Zinc-Chromate; (3) Parzate, Dithane D-14; (5) Zerlate; (6) Untreated. Injury: Copper-Zinc-Chromate caused slight yellowing and Bordeaux dwarfed the plants. Descending yield order was: (1) Zerlate, COCS, Dithane Z-78, Tribasic, Dithane D-14; (2) Copper-Zinc-Chromate, Parzate; (3) Bordeaux; (4) Untreated. First five preferential treatments are Tribasic, Bordeaux, Dithane Z-78, Dithane D-14, and Parzate.

WEST VIRGINIA: No control data presented. No injury observed. Materials in descending yield order are Bordeaux, Tribasic plus sticker, Copper-Zinc-Chromate, Tribasic alone. Cooperator's note: "Unusually heavy rainfall. In normal seasons Tribasic would equal Bordeaux and is much less trouble. Expense and availability places #658 (Copper-Zinc-Chromate) low in preferential rating. We recommend Tribasic plus sticker."

DISEASE OF NO SIGNIFICANCE

NORTH DAKOTA: Descending order of yield was: (1) Parzate dust, Parzate, Dithane D-14, Tribasic plus "Nu-Zinc"; (2) Zinc Nitrodithioacetate (629), Copper-Zinc-Chromate; (3) Zerlate dust, Dithane Z-78 dust; (4) Cuprocide dust, Tribasic dust, Tribasic; (5) Untreated (DDT).

NEW JERSEY: Dust Test. Descending order of yield was: (1) Tribasic, Copper-Zinc-Chromate; (2) Dithane Z-78, Untreated, Copper-Lime; (3) Yellow Cuprocide.

TOMATOES

ANTHRACNOSE

NEW JERSEY (New Brunswick): Descending control order was: (1) Bordeaux, Zerlate-Tribasic alternating, Zerlate; (2) Tribasic, Parzate, Dithane Z-78; (3) Untreated. Differences were not significant -- Untreated had only 3%. No injury observed. Yield in descending order was: (1) Untreated, Parzate; (2) Zerlate-Tribasic alternating, Dithane Z-78, Tribasic, Zerlate; (3) Bordeaux. No significant difference in yields. Cooperator's note: "Zerlate preferred for anthracnose."

NEW JERSEY (Smithburg): Descending control order was: (1) Zerlate -- 16%; (2) Zerlate-Tribasic alternating -- 27%; (3) Tribasic -- 40%; (4) Untreated -- 49%. No injury observed. Descending yield order was: (1) Tribasic, Zerlate-Tribasic alternating, Zerlate; (2) Untreated. Over-all preferred material -- Zerlate.

OHIO (Freemont): Descending control order was: (1) Zerlate -- 10%, Parzate -- 11.9%; (2) Zerlate-Tribasic alternating -- 12.4%; (3) Dithane Z-78 -- 14.4%, Zac -- 14.4%; (4) 658 -- 18.9%; (5) Tribasic -- 22.3%;

(6) 629 -- 29.7%; Untreated -- 29.3%. Injury: 658 slightly injurious. Descending yield order was: (1) Zerlate; (2) Parzate; (3) Zerlate-Tribasic alternating; (4) Tribasic, 658, Dithane Z-78; (5) Zac, 629; (6) Untreated. Cooperator's note: "629 very poor in this experiment."

OHIO (Bowling Green): Descending control order was: (1) Zerlate-Tribasic alternating, Zerlate, and Zerlate-Tribasic dust alternating; (2) Zac; (3) Dithane Z-78; (4) Tribasic dust, Untreated; (5) Tribasic spray. No injury reported. Descending yield order was: (1) Dithane Z-78; (2) Tribasic spray, Zac; (3) Zerlate-Tribasic dust alternating, Zerlate; (4) Tribasic dust, Zerlate-Tribasic spray alternating; (5) Untreated.

Note: The anthracnose data presented below was presented in conjunction with control data on Early Blight, Late Blight, and Septoria diseases. It is presented at this point to give a comprehensive picture of anthracnose control. Yield data will be presented in other places so marked that the yield data can be used in reference to this section.

NEW YORK: Descending order of control was: (1) Zerlate-Zerlate-Bordeaux-Zerlate-Bordeaux -- 3.4%; (2) Zerlate-Zerlate-Tribasic-Zerlate-Tribasic -- 4.8%; (3) Zerlate-Zerlate-Dithane Z-78-Zerlate-Dithane Z-78 -- 5.9%, Zerlate-Zerlate-Dithane Z-78-Zerlate-Dithane Z-78 -- 6.1%, Phygon XL -- 6.7%, Zerlate -- 6.8%, Zerlate-Parzate mixture -- 7.3%; (4) Untreated -- 12.8%; (5) Copper-Zinc-Chromate -- 14.1%

ILLINOIS: Test No. 1. Descending control order was: (1) Manganese ethylene bisdithiocarbamate -- 2.2%; (2) Zerlate-Parzate mixture -- 10.8%, Bioquin 1 plus Wettable Sulfur -- 13.0%; (3) IN-10425 -- 17.8%, Zerlate-Tribasic mixture -- 19.7%; (4) Zac -- 33.7%; Bioquin 1 -- 35.5%; (5) Untreated -- 47.5%, Bioquin 507 -- 48.8%, Tribasic plus zinc -- 50.2%.

Test No. 2. Dithane D-14 -- 5.1%; (2) Parzate -- 11.7%; (3) Dithane Z-78 -- 14.8%, Zerlate-Tribasic alternating -- 15.9%, Zerlate -- 17.5%; (4) Bioquin 1 -- 24.7%; (5) Bordeaux -- 33.7%, Tribasic -- 37.5%; (6) Untreated -- 63%.

OHIO: Descending control order was: (1) Methasan wettable -- 1.7%; (2) Zerlate -- 3.4%; (3) Tribasic A -- 4.2%, Parzate -- 4.3%, Dithane Z-78 -- 4.9%; (4) Tribasic -- 5.5%, Zac -- 5.8%; (5) 658 -- 6.9%; (6) 629 -- 11.3%; (7) Untreated -- 14.3%

PENNSYLVANIA: Descending control order was: (1) Dithane Z-78 -- 3.2%, Zerlate -- 3.3%; (2) Zerlate-Tribasic mixture -- 4.4%, Zac -- 4.6%, Parzate -- 5.2%; (3) Bordeaux -- 8.5%, Manganese ethylene bisdithiocarbamate -- 9.6%; (4) Tribasic -- 12.4%, Tribasic A -- 13.1%, Copper-Zinc-

Chromate -- 14.1%; (5) Untreated -- 28.5%.

DELAWARE: Descending control order was: (1) Bioquin 1 -- 5.1%; (2) Dithane Z-78 -- 6.3%, Zerlate -- 6.4%, Parzate -- 6.9%; Zerlate-Bordeaux split (3-2) schedule -- 7.1%, Zerlate-Parzate mixture (1-1) -- 7.4%; (3) Zerlate-Parzate alternating -- 8.2%, Zerlate-Tribasic alternating -- 9.3%, Bordeaux -- 9.6%; (4) Tribasic -- 12.3%; (5) Untreated -- 27.3%.

LATE BLIGHT

FLORIDA (Indiantown): Descending control order was: (1) Dithane D-14, Parzate; (2) Dithane Z-78; (3) Untreated. No injury noted. Yield in descending order was: (1) Parzate, Dithane D-14; (2) Dithane Z-78; (3) Untreated. Cooperator appended note stating that the Dithane Z-78 was a bad batch having large particle size.

NOVA SCOTIA: All treatments gave perfect control when the Untreated showed 89% infection. Phygon caused yellowing of the foliage late in the season. Descending yield order was: (1) Tribasic, Phygon, Zerlate-Bordeaux split (3-4) schedule; (2) Zerlate-Tribasic split schedule (3-4); (3) Bordeaux 10-7-100; (4) Bordeaux 7-5-100. Two best over-all preferential treatments are Tribasic and Zerlate-Tribasic split schedule.

EARLY BLIGHT

MINNESOTA: Descending control order was: (1) Bordeaux; (2) Parzate, Zerlate, Tribasic, Dithane Z-78; (3) Zerlate-Tribasic alternating; (4) Untreated. Injury: Bordeaux delayed ripening. Descending yield order was: (1) Parzate; (2) Untreated, Tribasic, Zerlate; (3) Dithane Z-78, Zerlate-Tribasic alternating; (4) Bordeaux. Preferred material: Parzate.

NORTH DAKOTA: Descending control order listed was (1) Zerlate, Tribasic; (2) Dithane Z-78; no control data listed for Phygon. Injury: Phygon caused some burning. No significant yield differences -- yields not listed.

CONNECTICUT: Descending control order was: (1) Phygon XL; (2) Zerlate, Dithane Z-78, Zerlate-Parzate alternating; (3) Fermate, Zerlate-Tribasic alternating, Parzate; (4) Untreated, Zerlate-Tribasic split schedule (3-2), Copper-Zinc-Chromate, Dithane D-14; (5) Tribasic, Bordeaux, COCS; (6) Yellow Cuprocide. Injury: Yellow Cuprocide caused some defoliation, and Dithane D-14 caused some bronzing of the foliage. No yield date were taken. Over-all preferential rating: (1) Zerlate, Dithane Z-78, Fermate, Parzate; (2) Phygon XL, Copper-Zinc-Chromate, Dithane D-14, Tribasic; (3) Bordeaux, COCS; (4) Yellow Cuprocide. Cooperator noted that Phygon XL irritated the skin of one operator.

EARLY BLIGHT AND ANTHRACNOSE (Anthracnose data presented above)

NEW YORK: Descending control order was: (1) Zerlate-Zerlate-Bordeaux-Zerlate-Bordeaux, Zerlate-Zerlate-Dithane D-14-Zerlate, Dithane D-14, Zerlate-Zerlate-Tribasic-Zerlate-Tribasic, Zerlate; (2) Zerlate-Parzate mixture; (3) Zerlate-Zerlate-Dithane Z-78-Zerlate-Dithane Z-78, Copper-Zinc-Chromate (658); (4) Phygon; (5) Untreated. Injury: Phygon caused blackening of fruit and Copper-Zinc-Chromate caused marginal leaf scorch. Descending yield order was: (1) Zerlate-Zerlate-Bordeaux-Zerlate-Bordeaux, Zerlate-Parzate mixture; (2) Zerlate-Zerlate-Dithane Z-78-Zerlate-Dithane Z-78, Phygon; (3) Zerlate, Zerlate-Zerlate-Dithane D-14-Zerlate-Dithane D-14; (4) Zerlate-Zerlate-Tribasic-Zerlate-Tribasic, Untreated; (5) Copper-Zinc-Chromate. Over-all preferred material: Zerlate-Zerlate-Bordeaux-Zerlate-Bordeaux.

ILLINOIS: Test No. 1. Descending control order was: (1) Manganese ethylene bisdithiocarbamate, Bioquin 1 plus Wettable Sulfur; (2) Zerlate-Parzate mixture, Zerlate-Tribasic mixture; (3) Bioquin 1; (4) Zac, IN-10425 plus zinc sulfate, Tribasic plus Zinc, Bioquin 50W; (5) Untreated. Injury: Zerlate-Parzate tank mixture caused marginal yellowing. Descending yield order was: (1) Manganese ethylene bisdithiocarbamate; (2) Zerlate-Parzate mixture, Bioquin 1 plus Wettable Sulfur; (3) IN-10425 plus zinc sulfate, Zerlate-Tribasic mixture; (4) Zac, Bioquin 1; (5) Bioquin 50W; (6) Untreated; (7) Tribasic plus zinc. Cooperator's note: "Tribasic plus zinc and Bioquin 50W not worthy of further trials. Zac and IN-10425 plus zinc sulfate not particularly outstanding. Bioquin 1 plus Wettable Sulfur most promising of all tested."

Test No. 2. Descending control order was: (1) Dithane Z-78, Dithane D-14, Parzate; (2) Bioquin 1, Zerlate-Tribasic alternating, Zerlate, Bordeaux; (3) Tribasic; (4) Untreated. Injury: Dithane D-14 and Parzate caused marginal yellowing of leaflets. Descending yield order was: (1) Dithane D-14, Dithane Z-78; (2) Parzate, Zerlate-Tribasic alternating; (3) Zerlate, Bioquin 1; (4) Bordeaux; (5) Tribasic; (6) Untreated. Cooperator's note: "If it can be shown conclusively that Parzate and Dithane Z-78 are equally non-toxic to tomatoes, then both would be given equal ratings throughout. Zerlate appeared to be somewhat poorer in controlling diseases than it has in the past. Bordeaux not worthy of inclusion in future trials for evaluating against early blight and anthracnose."

EARLY BLIGHT, LATE BLIGHT, ANTHRACNOSE (Anthracnose data reported above)

OHIO: Descending control order was: (1) Tribasic; (2) Parzate, 658, Dithane Z-78, Tribasic A, Methasan wettable; (3) Zerlate, Zac; (4) 629; (5) Untreated. Injury: 658 slightly injurious. Descending control order was: (1) Methasan Wettable, Parzate; (2) Tribasic, Tribasic A, Zerlate, Dithane Z-78, Zac; (3) 629, 658; (4) Untreated. Over-all

preferred materials: Methasan wettable, Parzate.

PENNSYLVANIA: Descending control order was: (1) Zerlate-Tribasic tank mix; (2) Dithane Z-78, Bordeaux; (3) Tribasic, Tribasic plus zinc, Parzate; (4) Copper-Zinc-Chromate (658), Zac, Liquid Parzate, Zerlate; (5) Untreated. Injury: Parzate caused leaf yellowing; Copper-Zinc-Chromate (658), Tribasic plus Zinc, and Tribasic caused slight stunting; Bordeaux caused stunting. Descending yield order was: (1) Dithane Z-78; (2) Bordeaux, Zerlate-Tribasic tank mix, Tribasic; (3) Tribasic plus Zinc; (4) Parzate, Zac; (5) Liquid Parzate, Copper-Zinc-Chromate; (6) Zerlate; (7) Untreated. Cooperator's note: "Favorable ripening in late September favored Dithane Z-78 and Bordeaux. Dithane Z-78 escaped its usual late blight loss and all Bordeaux-sprayed fruit finally ripened."

EARLY BLIGHT, SEPTORIA, AND ANTHRACNOSE (Anthracnose data reported above)

DELAWARE: Descending control order was: (1) Dithane Z-78, Parzate, Bioquin 1, Bordeaux; (2) Zerlate-Parzate mixture (1-1), Tribasic, Zerlate-Tribasic alternating, Zerlate-Parzate alternating, Zerlate-Bordeaux split (3-3) schedule; (3) Zerlate; (4) Untreated. No injury of consequence observed. Descending yield order was: (1) Zerlate Parzate (1-1), Bioquin 1, Zerlate, Zerlate-Parzate alternating, Dithane Z-78, Parzate; (2) Zerlate-Bordeaux split schedule, Bordeaux, Zerlate-Tribasic alternating, Tribasic; (3) Untreated. Over-all preferred treatments: Dithane Z-78, Parzate. Cooperator's note: "Zerlate did not seem to hold Septoria."

SEPTORIA, EARLY BLIGHT, AND LATE BLIGHT

MARYLAND (Hurlock): Descending control order was: (1) Bordeaux, Tribasic, Dithane Z-78; (2) Bioquin 50W, Dithane D-14; (3) Zerlate plus B1956, IN-10425, Calcium ethylene bisdithiocarbamate, Zerlate, Phygon XL, Zerlate-Tribasic split (3-2) schedule; (4) Untreated. Injury: Parzate and Phygon XL caused yellowing. Descending yield order was: (1) Tribasic; (2) Dithane Z-78, Bordeaux, Dithane D-14, Zerlate-Tribasic alternating; (3) Calcium ethylene bisdithiocarbamate, Bioquin 50W, Zerlate, Zerlate-Tribasic split (3-2) schedule, Zerlate plus B1956. Two preferred materials are Tribasic and Dithane Z-78. Cooperator's note: "Septoria leaf spot was principal disease present. Coppers gave better control of Septoria than organics. Practically no Anthracnose hence Zerlate showed up poorly -- it gave poor control of Septoria."

MARYLAND (Salisbury): Descending control order was: (1) Tribasic; (2) Tribasic dust, Parzate, Dithane D-14, Parzate dust, Zerlate dust; (3) Zerlate; (4) Untreated. No injury observed. Descending yield order was: (1) Tribasic, Zerlate, Tribasic dust, Zerlate dust, Dithane D-14; (2) Parzate; (3) Parzate dust; (4) Untreated. Cooperator's note:

"Early Blight was chief disease early in season during time fungicide applications were made. Septoria and Late Blight appeared late."

LATE BLIGHT AND LEAF MOLD

NORTH CAROLINA: Descending control order for Late Blight fruit infection was: (1) Tribasic dust, Tribasic; (2) Parzate, Parzate dust; (3) Zerlate-Tribasic dusts alternating; (4) Untreated. Descending control order for Leaf Mold was: (1) Tribasic, Tribasic dust; (2) Zerlate-Tribasic dusts alternating, Parzate; (3) Parzate dust; (4) Untreated. No injury noted. Descending yield order was: (1) Tribasic, Tribasic dust; (2) Parzate, Parzate dust; (3) Zerlate-Tribasic dusts alternating; (4) Untreated. Over-all preferred materials: (1) Tribasic spray or dust; (2) Parzate spray or dust.

EARLY BLIGHT AND STEMPHYLIUM

FLORIDA (Bradenton): Descending control order was: (1) Dithane D-14; (2) Liquid Parzate (Na); (3) Liquid Parzate (Ca); (4) Parzate; (5) SR-406, Yellow Cuprocide; (6) Phygon XL; (7) Untreated. No injury noted.

BUCKEYE ROT

TENNESSEE: Descending order of control of fruit infection was: (1) Copper A Compound, Tribasic, Bordeaux; (2) Untreated, COCS, Copper-Zinc-Chromate; (3) Zerlate, Parzate, Dithane D-14. In a dust test the materials used (Copper-Zinc-Chromate, COCS, Yellow Cuprocide, Dithane Z-78) were no better than the Untreated. Copper-Zinc-Chromate spray and dust were the only materials that significantly increased yield over that of the Untreated plants.

ARKANSAS: Descending control order of fruit infection was: (1) Tribasic -- 17.3%; (2) Dithane Z-78 -- 34.8%; (3) Zerlate -- 43.4%; (4) Untreated -- 56.7%. No injury noted. Descending yield order was: (1) Tribasic; (2) Dithane Z-78; (3) Zerlate; (4) Untreated. Over-all preference is as above yield and control order. Cooperator's note: "Excessive rainfall throughout the summer promoted a severe epidemic of Buckeye Rot. Septoria and Alternaria leaf spots were also present and undoubtedly depressed the yield in the case of the check plots. All the fungicides appeared to control these leaf spots."

NO DISEASE OF CONSEQUENCE

FLORIDA (Homestead): Plots abandoned because of mosaic, drought, and salt intrusion. No data presented.

FLORIDA (Indiantown): Stemphylium did not become serious until most of fruits were harvested. There was some nutritional effect present which increased the yield of the sprayed plots over that of the Un-

treated -- no explanation was offered.

TEXAS (Jacksonville): Test conducted under drought conditions. All the spray and dust materials used, except Stauffer No. 411, increased yield about 10 to 20%. No explanation offered.

IOWA (Ames and Conesville): Yield differences were not significant in both experiments.

WATERMELONS

DOWNY MILDEW

FLORIDA (Leesburg): Dust test. Descending control order was: (1) Dithane Z-78; (2) Copper-Zinc-Lime; (3) COCS. Leaf injury and reduced fruit set reported for Copper-Zinc-Lime and COCS. No yield data reported.

ANTHRACNOSE AND DOWNY MILDEW

FLORIDA (Leesburg): Dust test. Disease of no consequence. Injury data: Copper-Zinc-Lime reduced fruit set and Parzate-Zerlate mixture is suspected of having done so; Dithane Z-78, Zerlate, and Parzate were non-injurious.

NORTH CAROLINA: Dust test. Descending control order was: (1) Zerlate; (2) Parzate, Tribasic-Sulfur; (3) Tribasic; (4) Untreated. Tribasic depressed yields. Diseases appeared late and did not affect yields. Under these conditions, descending order of yield was: (1) Untreated and Zerlate; (2) Tribasic-Sulfur and Parzate; (3) Tribasic. (Tribasic was significantly lower than the Untreated.)

CANTALOUPES

MACROSPORIUM LEAF SPOT

MARYLAND: Some anthracnose was also present in the test plot, but Macrosporium was the chief disease. Descending control order was: (1) Bordeaux, Dithane Z-78, Zerlate-Tribasic alternating; (2) Bioquin 50W, Zerlate plus B-1956; (3) Zerlate, Tribasic, Parzate, Phygon XL; (4) Untreated. Zerlate-Tribasic alternating caused stunting and yellowing; Parzate caused yellowing; and Bordeaux caused stunting. Descending yield order was: (1) Dithane Z-78; (2) Zerlate, Untreated, Bioquin, Zerlate plus B-1956; (3) Tribasic; (4) Parzate, Phygon XL, Zerlate-Tribasic alternating; (5) Bordeaux. (Bordeaux, Zerlate-Tribasic alternating, Phygon XL, Parzate, and Tribasic significantly reduced yield.) Over-all preferred fungicides are Dithane Z-78 and Zerlate.

DELAWARE: Spray and dust test. The Macrosporium came in late and

did not affect yields. Descending order of yield was: (1) Untreated, Tribasic dust, Parzate spray, Dithane Z-78 dust, Fermate dust, Copper A Compound dust, Zerlate dust; (2) Zerlate spray, Parzate dust, Dithane Z-78 spray; (3) Tribasic spray; (4) Copper A Compound spray and Bordeaux spray. (Bordeaux and Copper A Compound sprays significantly reduced the yield; the reduction in yield by Tribasic spray just missed being significant.)

DOWNY MILDEW AND ANTHRACNOSE

NORTH CAROLINA: Dust test. Descending control order was: (1) Dithane Z-78, Zerlate, Parzate, Tribasic; (2) Untreated. Descending yield order (not significant) was: (1) Tribasic and Untreated; (2) Zerlate and Dithane Z-78; (3) Parzate. Over-all preferred material was Tribasic.

ANTHRACNOSE

TENNESSEE: Descending control order for anthracnose fruit rot was: G-4 -- 3.3; Puraturf 177 -- 4.6; Copper A Compound -- 6.5; Untreated -- 11.2. No yield data reported.

NO DISEASE

MICHIGAN: No significant differences in yield.

CUCUMBERS

DOWNY MILDEW AND ANTHRACNOSE

LOUISIANA: Dust test. Anthracnose was light; downy mildew was more severe. Descending order of control for downy mildew was: (1) Zerlate, Fermate, Parzate; (2) Dithane Z-78 and Tribasic; for anthracnose the order was: (1) Dithane Z-78, Fermate, Parzate; (2) Tribasic and Zerlate. Plants treated with Zerlate and Parzate seemed to lack vigor. Descending yield (Bu./A) order was: Dithane Z-78 -- 241; Tribasic -- 231; Zerlate -- 219; Parzate -- 195; Fermate -- 165. Cooperator's note: "Low yield for Fermate was due partly to variation in test field."

DELAWARE (cucumbers for pickles): Downy mildew was the major disease; anthracnose was only present in sufficient amounts for observation. Descending order of control was: (1) Dithane Z-78, Tribasic; (2) Bordeaux, Fermate, Parzate, Zerlate, Copper A Compound, Zerlate-Parzate (1-1); (3) Untreated. Copper A Compound, Bordeaux, and Tribasic caused typical copper injury; Parzate dwarfed the plants. Descending yield order was: (1) Zerlate, Dithane Z-78; (2) Bordeaux, Fermate, Tribasic; (3) Zerlate-Parzate (1-1); (4) Untreated, Parzate; (5) Copper A Compound. Over-all preferred materials: Dithane Z-78 and Zerlate.

The dithiocarbamates controlled anthracnose whereas the coppers did not.

ANTHRACNOSE

OHIO: Dust test. Descending order of control on fruit was: (1) Parzate, Dithane Z-78; (2) Zerlate, Copper A Compound; (3) Tribasic; (4) Fermate, Zac, 629, 658. No injury reported. Descending yield order was: (1) Copper A Compound and Parzate; (2) Zerlate, Tribasic, 658, Dithane Z-78, Fermate; (3) Zac. Over-all preference in descending order: Zerlate, Copper A Compound, Dithane Z-78, Tribasic, Parzate, Fermate, Zac.

BACTERIAL WILT

OHIO: Dust test. Disease not serious. Over-all preference in descending order: Zerlate, 658, Dithane Z-78, Tribasic, Copper A Compound, Parzate, Fermate, Zac.

NO DISEASE

MICHIGAN: Yield in descending order was: (1) Dithane Z-78 and Untreated; (2) Zerlate, Tribasic, Parzate; (3) General Chemical 629 plus 308. Over-all preference in descending order: (1) Dithane Z-78; (2) Zerlate and Tribasic; (3) Parzate. Cooperator's note: "Probably the 629 plus 308 should be dropped; may have caused injury."

CELERY

EARLY BLIGHT (Cercospora)

ONTARIO: Descending control order was: (1) Parzate; (2) Phygon, Zac, Bordeaux, Bordow, Karbam White; (3) 341 C; (4) Untreated. Only injury was slight chlorosis from Zac. No yield data reported.

FLORIDA (Sanford): Descending control order was: (1) Fermate, Tribasic, Copper A Compound, Bordeaux, Zerlate, Karbam White; (2) Parzate, Dithane; (3) Phygon; (4) Untreated. Except for Fermate, the dithiocarbamates caused some bleaching and chlorosis; the copper caused stunting; and Phygon caused leaf and petiole spots. Descending yield order was; (1) Bordeaux, Fermate, Copper A Compound, Tribasic, Karbam; (2) Zerlate, Parzate, Phygon, Dithane; and (3) Untreated. Cooperator's note: "Fermate or Karbam Black produces darker green plants and is first choice. Mixtures or alternating schedules have no advantage over individual treatments. Phygon not worthy of further trial."

FLORIDA (Belle Glade -- late winter and early spring): Descending control order was: (1) Dithane D-14; (2) Dithane D-14-Copper A Compound alternating, and Dithane D-14-Tribasic alternating; (3) Dithane D-14-

Cuprocide alternating; (4) Zerlate and Zerlate-Fermate mixture; (5) Untreated. Only injury was slight chlorosis by Yellow Cuprocide. Descending yield order was correlated with control data. Over-all preferential rating: (1) Dithane D-14 alternating with either Copper A Compound, Tribasic, or Yellow Cuprocide; (2) Dithane D-14 alone; (3)Zerlate; (4) Zerlate-Fermate mixture. Cooperator's note: "Dithane D-14 alone will not give the control of Rhizoctonia that the alternate schedules with copper will. Hence, it is not recommended as a complete celery fungicide. Zerlate and Zerlate-Fermate mixture are not worthy of further trial."

FLORIDA (Belle Glade -- late spring): Descending control order was: Dithane D-14, Parzate, Dithane Z-78; (2) Dithane D-14 alternating with either Copper A Compound or Tribasic; (3) Dithane D-14 alternating with Yellow Cuprocide; (4) Karbam White, Zerlate-Fermate mixture, Karbam White-Karbam Black mixture, HL 275; (5) Zerlate; and (6) Untreated. Descending yield order was: (1) Dithane D-14, Parzate, Dithane Z-78, Dithane D-14 alternating with Yellow Cuprocide, or Copper A Compound, or Tribasic; (2) HL 275, Karbam White, Zerlate, Zerlate-Fermate mixture, KarbamWhite-Karbam Black mixture; (3) Untreated. Over-all preferential rating: (1) Dithane D-14 alternating with Copper A Compound, or Yellow Cuprocide, or Tribasic; (2) Dithane D-14, Parzate, Dithane Z-78. Cooperator's note: "Rhizoctonia was again bad, hence the preference for the D-14-copper schedules. Zerlate, Fermate, the Karbams, and HL 275 will not be used again. Dithane D-14, Parzate, and Dithane Z-78 will not be used except with the copper fungicides."

LATE BLIGHT (Septoria)

BRITISH COLUMBIA: Descending control order was: (1) Fermate liqui-dust; (2) Monocop 26 dry dust; (3) Monocop 26 liqui-dust; (4) Untreated. No yield data reported.

OREGON: Over-all preferential rating was Phygon, Zerlate, and Parzate. Materials used as sprays, dusts, and combined with sulfur were: Phygon, Parzate, Zerlate, and COCS. All materials except COCS gave practically perfect control, and COCS dust gave 95% control whereas as a spray it gave 80% control. No yield data reported. Cooperator's note: "Phygon-Sulfur and Parzate-Sulfur sprays left an unsightly residue. Phygon spray and dust caused some etiolation. COCS not worthy of further testing."

CONNECTICUT: Parzate, Phygon XL, and Dithane Z-78 gave practically perfect control compared to 77% in the Untreated. Phygon XL irritated one operator. No yield data reported.

EARLY AND LATE BLIGHTS

MICHIGAN: Dust test. Descending control order was: (1) Dithane-Sulfur, Dithane, Cuprocide-Sulfur, Tribasic-Sulfur-Zinc; (2) Tribasic-Sulfur; (3) Tribasic. Over-all preferential rating in descending order: (1) Dithane-Sulfur; (2) Cuprocide-Sulfur; (3) Dithane; (4) Tribasic-Sulfur-Zinc. Cooperator's note: "Dithane or coppers combined with sulfur were superior to these materials alone. Adding 'Nu-Zinc' to Tribasic-Sulfur greatly increased efficiency."

ONION

DOWNY MILDEW

BRITISH COLUMBIA: Liqui-Duster Test: Yield (lbs) in descending order was: (1) Fermate liqui-dust -- 128; (2) E.F.531 -- 99, E.F.169 -- 99; Fermate spray -- 95, Phygon spray -- 90, FMC (70%) spray -- 89, E.F.341 "C" spray -- 88, Karbam White spray -- 88; (3) Bioquin 1 spray -- 77, Perenox spray -- 73, Untreated -- 74. No injury was observed. Spray and Dust Test: Descending control order was: (1) Fermate spray and Perenox spray; (2) Karbam White spray; (3) Fermate dust (10%); (4) Untreated. No injury observed. No yield data presented. Cooperator reported Fermate dust unworthy of further trial.

PURPLE BLOTCH

COLORADO: Two tests reported; applications made 11 to 12 weeks after emergence at 10-day intervals. Spray Test: Over-all preferential rating in descending order was: (1) BCA and Copper A Compound; (2) Dithane D-14; (3) Cuprocide. Cooperator's note: "On the basis of one year's data, Cuprocide, Copper A Compound, BCA, and Dithane D-14 are worthy of further trial. PAS, Bordeaux, Fermate, and Parzate do not justify further use. Application should be made 1 to 2 weeks after emergence." Dust Test: Over-all preferential rating was Copper A Compound, BCA, and Cuprocide. Cooperator's note: "Parzate, Zerlate, and Fermate not worthy of further trial."

LIMA BEANS
(Henderson Bush)

STEM ANTHRACNOSE

NORTH CAROLINA: Descending order of control was: (1) Dithane Z-78 (1.5-100) and Phygon XL (1.5-100); (2) Phygon XL (1.0-100); (3) Fermate (3-100), Phygon XL (0.5-100), Zerlate (1.5-100), and Untreated. No injury except from Phygon XL at 1.5-100. Descending order of yield (Bu./A) was: (1) Dithane Z-78 -- 355; (2) Phygon XL (0.5-100) -- 317;

Phygon XL (1.0-100) -- 297; Zerlate -- 296; (3) Phygon XL (1.5-100) -- 283, Fermate -- 283; (4) Untreated -- 191. All treatments were significantly better than the Untreated, and Dithane Z-78 was significantly better than all treatments but Phygon XL (0.5-100) as regards yield.

STRING BEANS
(Bountiful)

ANTHRACNOSE

CONNECTICUT: Descending order of control was: (1) Parzate, Fermate, Phygon XL, Dithane Z-78; (2) Untreated. No material caused injury. No yield data presented. Phygon XL irritated the skin of one operator.

CABBAGE

DOWNY MILDEW

FLORIDA (Hastings): Two tests, the first being a spray and dust test on seedlings in the plant bed and the second being a test on heading cabbage.

Plant Bed Test. Descending order of control was: (1) Spergon spray and Spergon dust; (2) Dithane spray and Phygon dust; (3) Parzate dust; (4) Karbam White spray and Phygon spray; (5) Untreated. Phygon spray caused injury. The descending order of yield was correlated with control.

Heading Cabbage Test. Over-all preferential rating in descending order was: (1) Spergon dust; (2) Dithane D-14 spray; (3) Parzate spray; (4) Copper A Compound dust; (5) Copper A Compound spray; (6) Tribasic spray; (7) Tribasic-Zinc dust; (8) Karbam White dust; (9) Parzate dust; (10) Teresan dust; (11) Fermate dust; (12) Chromate 658 spray; (13) Dithane Z-78 dust; (14) Fermate spray; (15) Untreated; (16) Karbam White spray; (17) Teresan.

ALTERNARIA LEAF SPOT

FLORIDA (Hastings): Descending order of control was: (1) Karbam White, Parzate, Fermate; (2) Spergon and Tersan; (3) Tribasic, Copper A Compound, Chromate 658; (4) Cr. 1639; (5) Phygon. Phygon caused severe injury. No yield data presented. Karbam White, Parzate, and Fermate were listed as the first three preferred materials.

ANTHRACNOSE

NORTH CAROLINA: Descending control order was: (1) Spergon; (2) Dithane Z-78, Zerlate, Fermate; (3) Untreated. Spergon caused slight injury. No yield data presented. Fermate gave an objectionable residue.

USEFULNESS OF SOME OF THE NEWER ORGANIC FUNGICIDES FOR VEGETABLE DISEASE CONTROL

The listing below, based entirely on information contained in this report, is a tentative one. As all materials were not used in all tests, some tests having as few as three materials and others ten or more, it is impossible to accurately compare one material with another. Tables were prepared showing the performance of each material in all tests on each crop as regards disease control, phytotoxicity, and yield. These tables were then used en masse to prepare the listing. Points of major general interest were as follows:

1. The excellent performance of the zinc ethylene bisdithiocarbamates (Dithane D-14, Dithane Z-78, Parzate) on a rather wide range of vegetable crops.

2. The fact that Parzate was phytotoxic when Dithane Z-78 was not, indicating the importance of formulation. (These two materials have the same active ingredient.)

3. The fact that Zerlate apparently failed to control Septoria leaf spot on tomatoes and was of doubtful value for the control of Macrosporium leaf spot on cantaloupes. This, plus the ineffectiveness of Zerlate for control of late blight of potato and tomato, indicates that Zerlate is restricted in range.

4. When disease was of little or no consequence, the zinc ethylene bisdithiocarbamates did not increase yield.

BIOQUIN 1 and 50W: The high cost of these materials will limit their use. In some tests they did fairly well on tomatoes.

CHROMATE 658: Although it performed quite well, it was not as good as the zinc ethylene bisdithiocarbamates. It was injurious to potatoes and tomatoes.

DITHANE D-14: Outstanding on potatoes and tomatoes, good on celery, and second only to Spergon on cabbage. In some tests it caused slight leaf injury.

DITHANE Z-78: Better than Dithane D-14 on tomatoes and as good on potatoes; the best material on cucurbits; not as effective as some other materials on celery; top material on Henderson lima beans; and on cabbage, equal to Dithane D-14.

FERMATE: Has just about disappeared from use on potatoes and tomatoes and is being replaced by the zinc dithiocarbamates on cucurbits. It does well on celery for early blight control, on onions for downy mildew control, and on cabbage for the control of Alternaria.

G.C. 308: Limited tests show little value.

G.C. 629: Gave the highest yield of potatoes in Michigan. In other States it was of little value on potatoes and tomatoes.

G.C. 629-308: Showed little promise.

KARBAM (BLACK): Similar to Fermate.

KARBAM (WHITE): Similar to Zerlate.

LIQUID PARZATE: Limited tests indicate performance similar to Dithane D-14.

MANGANESE ETHYLENE BISDITHIOCARBAMATE: Performance not as good as that of the zinc ethylene bisdithiocarbamates.

P.E.P.S.: No longer being tested.

PARZATE: Will do everything that Dithane Z-78 will do, but was injurious on cucurbits.

SPERGON: Continues to be the best material for control of downy mildew on cabbage, and in North Carolina it gave the best control Anthracnose on cabbage. It has disappeared from tests on other crops.

ZAC: Not quite as good as the zinc ethylene bisdithiocarbamates.

ZERLATE: Being displaced on potatoes by the zinc ethylene bisdithiocarbamates. On tomatoes, it continues to be the top material for Anthracnose control, but it apparently will not control Septoria; in some tests, it appeared less effective than usual against early blight. It did not control Macrosporium leaf spot on cantaloupes as well as did the zinc ethylene bisdithiocarbamates. The trend seems to be that Zerlate will be superseded by the zinc ethylene bisdithiocarbamates, except for special purposes.

ZERLATE-FIXED COPPER (Alternating Schedule): Did well on tomatoes.

ZERLATE-BORDEAUX (Split Schedule): Appears very good on tomatoes It is anticipated that a zinc ethylene bisdithiocarbamate will be substituted for the Zerlate in time.

ZERLATE-PARZATE (etc.) Tank Mixtures: Appear promising on potatoes and tomatoes. Further tests are needed.

RESULTS WITH ORNAMENTAL CROPS, SHADE TREES AND TURF

Reports were received from 22 cooperators in 15 states. Included were reports on carnation, chrysanthemum, gladiolus, narcissus, rose, snapdragon, turf, and 17 shade trees. Parts of the reports on gladiolus and on narcissus were concerned with cooperative trials in several states.

CARNATION

ALTERNARIA BLIGHT: NEW YORK (Farmingdale): Bioquin 1, Phygon XL, Zerlate, Parzate, and bordeaux 8-8-100 gave good control while Fermate and manganese ethylene bis dithiocarbamate were slightly less effective.

FUSARIUM ROOT ROT AND WILT AND BACTERIAL WILT: COLORADO. Dithane D-14, Dithane Z-78, DuBay 1230 BS, Chloramine, Ceresan M, Aresan, Phygon, Calogreen, Geon Latex 31, and Goodrite Z.A.C. 100% and the four antibiotics penicillin, gliocladicin, aspergillin, and an unknown, were tested as soil drenches against these diseases in greenhouse benches. Dithane Z-78, penicillin, aspergillin, and the unknown antibiotic resulted in a marked reduction in infection. The other materials were relatively ineffective. Dithane D-14 injured the plants.

CHRYSANTHEMUM

SEPTORIA LEAFSPOT: NEW YORK (Farmingdale and Ithaca). Parzate and Dithane D-14 plus zinc sulfate both gave excellent control when used on a weekly schedule. Biweekly applications of these and Dithane Z-78, manganese ethylene bis dithiocarbamate (powder), and IN10425 (liquid) were somewhat less effective. All of the zinc-containing materials caused marginal chlorsis of the older leaves. Fermate, on the basis of previous tests, is still recommended although it was not included in these trials.

GLADIOLUS

LEAF SPOTS (Botrytis, Curvularia, and Stemphylium): FLORIDA. Botrytis and Curvularia were controlled on Snow Princess and Picardy varieties in the following descending order of efficacy: Dithane D-14 plus zinc sulfate, Parzate, Dithane Z-78, Phygon, Zerlate, Puratized Agricultural Spray, Fermate, Cornell silver spray, Glyoxalidine 341 C. Control of Stemphylium was in the same order with but one exception, Puratized gave better control than Zerlate. Phygon caused a stunting of the corms and premature death of the plants. With the exception of the three ethylene bis dithiocarbamate materials, none of the other

materials are considered worthy of further trial.

FUSARIUM ROT: COLORADO, FLORIDA, ILLINOIS, MARYLAND, MICHIGAN, NEW YORK, OHIO, SOUTH DAKOTA. The following materials were used on Picardy corms and cormels from one source in a cooperative test: New Improved Ceresan, Ceresan M, Lysol, Arasan, Dow 9B Wettable Seed Protectant, Dowicide B, Puratized Agricultural Spray, Parzate, and mercuric chloride. In general, rot control was best with Dowicide B, followed by New Improved Ceresan, Lysol, and Dow 9B. Arasan was effective in Colorado, Maryland, and New York but not in the other States; Ceresan M was effective in New York; and Puratized Agricultural Spray was generally ineffective. No injury was reported from any of these treatments.

FLORIDA. In additional tests. New Improved Ceresan, Dow 9B, and Ceresan M (1/8 %) gave best rot control, closely followed by Phygon, Spergon, Tersan, and SR-406. Parzate and Fermate gave the poorest control. The first three materials listed delayed emergence, and 1/4 % Ceresan M as a 5 minute dip killed the corms. Phygon caused a dwarfing of the corms.

ILLINOIS. Rot control was in the following descending order: New Improved Ceresan, Dow F-800, Arasan SF, manganese ethylene bis dithiocarbamate, and Puraturf 177. New Improved Ceresan was far superior. Also the standard New Improved Ceresan treatment gave superior rot control in comparison with long soaks in Puratized Agricultural Spray solutions. These long treatments resulted in the production of smaller corms. In one year's trial Dow F-800, Dow 9B, Arasan, Semesan Jr., and Ceresan M, as dusts, gave better control than the standard New Improved Ceresan dip. Phygon, Parzate, and Semesan dusts gave poorer control. Ceresan M and Semesan delayed blooming and stunted the plants.

KANSAS. No rot control was obtained when Parzate, New Improved Ceresan, and Fermate treatments were compared.

NEW YORK (Long Island). Rot control was good with mercuric chloride, and New Improved Ceresan, and fair with General Chemical AG1609B and Dithane D-14 plus zinc sulfate. No control was obtained with Puraturf 177. New Improved Ceresan and mercuric chloride resulted in delayed emergence, and the production of narrow leaves. Puraturf 177 caused a yellowing and twisting of the leaves. Flower and corm yields were best with New Improved Ceresan and mercuric chloride.

SCAB: In the cooperative test mentioned above scab was extremely variable. Mercuric chloride was the only material that reduced scab appreciably but it was effective only in Florida, Illinois, Maryland, Michigan, and Ohio, and not in Colorado, New York, or South Dakota. None of the other materials were effective and the amount of scab was generally greater when Lysol, Arasan, and Dow 9B were used.

SCLEROTINIA DRY ROT: WASHINGTON. Picardy corms were treated with Arasan, Tersan, Ceresan M, Calogreen, Puraturf 177, Dowicide 9B, and Standen #307 before planting. Puraturf 177 gave best control, followed by Arasan and Standen #307. Control was poor with the other materials. Highest yields were obtained with Puraturf 177, Arasan, Standen #307, and Tersan.

NARCISSUS

FUSARIUM BASAL ROT: MARYLAND, NEW YORK, NORTH CAROLINA, WASHINGTON. New Improved Ceresan, 2% Ceresan, Ceresan M, Arasan, Spergon, and Mersolite 8 were compared on narcissus for the control of basal rot in a cooperative test. In general, equally good rot control was obtained with the three Ceresans and with Mersolite 8. Arasan and Spergon gave very good control of rot in North Carolina and Maryland, but poor control in New York where there was a high percentage of infection in the bulb populations used. The three Ceresans all caused flower injury although Ceresan M caused the least. Flower injury was most severe with New Improved Ceresan in North Carolina whereas in Maryland, New York, and Washington 2% Ceresan caused the most flower injury. Considerable reduction in bulb yields occurred when New Improved and 2% Ceresan were used. Best over-all weight of healthy bulbs occurred when Mersolite 8 was used.

MARYLAND. Arasan SF, Dow 9B, Mersolite P, Spergon (Wettable), Puraturf 177, Tersan, bismuth subsalicylate, New Improved Ceresan and Parzate were compared. Rot control was good with the first three of these materials and also with New Improved Ceresan although the latter caused flower injury. Parzate and Puraturf 177 injured the bulbs, which resulted in decreased yields.

ROSE

BLACK SPOT: ARKANSAS. Weekly dust applications of Fermate rose dust, tribasic copper sulfate (1% metallic copper), or sulfur reduced black spot infection in the Etoile de Hollande and Edith Nellie Perkins varieties of roses from 67% in the untreated to 17 to 22% in the treated. Fermate rose dust was slightly better than the other two treatments.

TEXAS: Talisman and Golden Charm roses were not injured by 5 applications of the following dust mixtures; (1) sulfur (90%) +Tennesee Copper 34 (10%); (2) Tennesse Copper 34 (10%) +Dresinate XXX (5%) +sulfur (85%); (3) Dow Rose Dust; (4) Zerlate (7.5%) +sulfur (92.5%); (5) Michigan Chemical Company Rose Dust; (6) Niagara Sprayer R-1856; (7) Parzate (5%) +Fermate (5%); (8)Parzate (10%); (9) Tennesse Copper 34 (10%) +Oil (2%). Condesa de Sastago roses were not injured by 2 applications of the following dust mixtures: (1) DDT (10%) +Copper

(3.4%) +sulfur (86.7%); (2) Toxaphene (10%) +Copper (3.4%) +sulfur (86.7%); (3) Toxaphene (20%) +Copper (3.4%) +sulfur (76.7%); (4) sulfur (90%) +Copper (3.4%) +Chlordane (3%) +DDT (3%). Because of the dry season black spot was not a problem.

SNAPDRAGON

BOTRYTIS BLIGHT: COLORADO. Applications of bordeaux 8-8-100, Cuprocide, Phygon (wettable), Dithane D-14 + zinc sulfate +lime, Zerlate, or Fermate, as sprays, and Cuprocide, Parzate, or Zerlate as dusts were made on snapdragons on a ten-day schedule in greenhouses. Bordeaux and Dithane D-14 gave the best control, followed by Cuprocide (either as a dust or spray), Zerlate (spray), Parzate, Zerlate (dust), Fermate, Dithane Z-78, and Phygon. Control with the last three materials was negligible. Parzate, Dithane Z-78, and Zerlate dusts caused slight blossom burn if the temperature was above 70° F.

RUST: CALIFORNIA, NEW YORK (Ithaca and Farmingdale). Parzate, Dithane D-14 plus zinc sulfate, Dithane Z-78, manganese ethylene bis dithiocarbamate (powder), and IN10425 (liquid) plus zinc sulfate, each combined with Du Pont Spreader-Sticker, were tested on snapdragons. The first two materials were tested on both weekly and biweekly schedules and the last three on biweekly schedules only. Weekly applications of Parzate gave excellent control at all three places and Dithane D-14 was equally as effective in California but slightly less so in New York. Unsatisfactory control was obtained with all of the materials on a biweekly schedule in California and at Ithaca. At Farmingdale good control was obtained with biweekly applications of IN10425, manganese ethylene bis dithiocarbamate, and Dithane D-14, and fair control with Dithane Z-78 and Parzate. Parzate left a conspicuous residue on the foliage.

SHADE TREES

BLACK WALNUT

MARSSONINA LEAF SPOT: ILLINOIS. Puratized Agricultural Spray, Fermate plus lime, bordeaux 8-8-100 plus zinc sulfate, Givauden-Delawanna G-11, and Zerlate were tested. Good control was obtained with Puratized Agricultural Spray and Fermate plus lime, fair control with G-11 and bordeaux plus zinc sulfate, and none was obtained with Zerlate.

SYCAMORE

ANTHRACNOSE: ILLINOIS. Puratized Agricultural Spray reduced anthracnose infection. A number of other materials were used in other

plots but the data are unreliable because of the small amount of anthracnose.

FUNGICIDE INJURY TO SHADE TREE FOLIAGE: ILLINOIS. A number of shade trees were sprayed with different fungicides and, while leafspot diseases were insufficient to provide disease control data, observations were made on phytotoxicity. Puratized Agricultural Spray caused slight brown spotting on the under surface of sycamore leaves; G-4 caused slight leaf burn on catalpa and hard maple and a slight bronzing of the lower leaves of black walnut; G-11 caused a slight leaf burn on Norway maple and a slight yellowing and a leaf drop on black walnut; Fermate plus lime produced a slight blackening on the under side of black walnut leaflets; cuprous oxide and manganese ethylene bis dithiocarbamate each burned the margins of black walnut leaves; 341-C, 658, and Parzate caused a slight bronzing of some of the lower leaves of black walnut; and Puraturf 177 caused abundant yellowing and premature leaf drop on Ulmus parvifolia. No injury was observed on trees sprayed as follows: Bordeaux 8-8-100 plus zinc sulfate on American elm, black walnut, white oak; Puratized Agricultural Spray on American elm, black walnut, Norway maple, hard maple, white ash, catalpa, white oak, hackberry; G-4 on American elm, Ulmus parvifolia, Norway maple, white ash, hackberry; G-11 on American elm, Ulmus parvifolia, U. pumila, black walnut, English elm, linden, mountain ash, white oak; Fermate and lime on American elm, Ulmus parvifolia, white oak; Zerlate on American elm, Ulmus pumila, black walnut; Dithane Z-78 on American elm, U. parvifolia; special cuprous oxide on American elm, Ulmus pumila, U. parvifolia, English elm, sycamore, Norway maple, hard maple, linden, mountain ash, white ash, catalpa, red oak, white oak, hackberry, soft maple; 341-A on American elm, U. parvifolia; 341-C on American elm, Ulmus pumila, U. parvifolia, English elm, sycamore, Norway maple, hard maple, linden, mountain ash, American white birch, catalpa, red oak, soft maple; 531 on American elm, Ulmus parvifolia; 658 on American elm, Ulmus pumila, U. parvifolia, English elm, Norway maple, hard maple; Z.A.C. on American elm, Ulmus parvifolia, U. pumila, English elm, sycamore, black walnut, Norway maple, hard maple, American white birch, white ash, red oak, white oak, soft maple; Parzate or manganese ethylene bis dithiocarbamate on American elm, Ulmus parvifolia, U. pumila, English elm, black walnut, sycamore, Norway maple, hard maple, linden, mountain ash, American white birch, white ash, catalpa, red oak, hackberry, soft maple; Puraturf 177 on American elm, black walnut, sycamore, or catalpa.

TURF

(Bent Grasses)

LARGE BROWN PATCH: RHODE ISLAND. In one test Calochlor was most effective, followed by Puraturf 177 and GG. Cd C was not effective and

Cd A and Cd B resulted in an increase in the affected area. In another test Spergon W, Tersan, and Phygon gave complete control; Special Semesan, H258D, Calochlor, and Puraturf 177, good control; and 7 R 2312 gave some control. Calochlor caused some injury.

DOLLARSPOT: RHODE ISLAND. In one test Puraturf 177, GG, and Cd B gave excellent control; Cd C, good control; and Cd A and Calochlor, fair control. In another test 7 R 2312 and Puraturf 177 gave good control, and H258D and Calochlor poor control. Spergon W, Tersan, Phygon, and Special Semesan were not effective.

EFFECTIVENESS OF SOME OF THE NEWER MATERIALS ON TURF, ORNAMENTALS, AND SHADE TREES

ARASAN. Gives good control of gladiolus dry rot and appears to be promising in some areas for the control of Fusarium rot, although it seems to increase the amount of scab. It is fairly effective against narcissus basal rot in some areas.

BIOQUIN 1. Effective against Alternaria blight of carnations.

CERESAN M. This is as effective as New Improved Ceresan or 2% Ceresan for basal rot of narcissus but is much less injurious. It should be given further trials for Fusarium on gladiolus although it gives poor control of gladiolus dry rot.

DITHANE D-14. Has given good results with Septoria leaf spot of chrysanthemum, gladiolus leaf spots, and snapdragon rust.

DITHANE Z-78. Effective for gladiolus leaf spots and shows promise as a soil drench for the control of soil-borne diseases of carnations.

DOW 9B. Looks good for gladiolus Fusarium either as a dip or as a dust, also merits further trial for the control of basal rot of narcissus.

DOW F-800. Deserves further trial for the control of gladiolus Fusarium, particularly when used as a dust treatment.

DOWICIDE B. Has given good Fusarium rot control in gladiolus.

FERMATE. This is very effective for Septoria leaf spot of chrysanthemum but has not been effective against Fusarium rot and the leaf spots of gladiolus.

GLYOXALIDINE 341-C. Was not effective against gladiolus leaf spots and causes some injury on black walnut.

MANGANESE ETHYLENE BIS DITHIOCARBAMATE. Looks promising for Alternaria blight of carnations, and Septoria leaf spot of chrysanthemums. It burned the margins of black walnut leaves.

MERSOLITE. Mersolite 8 has been very effective against narcissus basal rot and does not cause the flower injury that frequently results from treatment with the Ceresans. Mersolite P as a dust merits further trial as a control for the basal rot of narcissus.

PARZATE. This has been very effective for Alternaria blight of carnations, Septoria leaf spot cn chrysanthemums, gladiolus leaf spots, and snapdragon rust. It has given poor control of Fusarium rot in gladiolus and has injured narcissus bulbs.

PHYGON: This has been effective for brown patch of turf but ineffective against dollarspot. It was injurious when used as a spray on gladiolus. Phygon XL has been effective against Alternaria blight of carnations.

PURATIZED AGRICULTURAL SPRAY. Was effective against leaf spot on black walnut but injured sycamore leaves. Small corms were produced following prolonged soaks of gladiolus corms in solutions of this material. It was ineffective against Fusarium and leaf spots in gladiolus.

PURATURF 177. This was effective against large brown patch and dollarspot of turf and dry rot of gladiolus, but was not effective against the gladiolus Fusarium. It injured gladiolus, narcissus, and leaves of Ulmus parvifolia.

SPERGON W. This was effective in controlling the large brown patch of turf but was ineffective against dollarspot.

ZERLATE. This was effective against Alternaria blight of carnations but was ineffective against leaf spots of gladiolus and leaf spot of black walnut.

RESULTS WITH MISCELLANEOUS DISEASES

TOBACCO

BLUE MOLD:

GEORGIA; SOUTH CAROLINA; NORTH CAROLINA; VIRGINIA; MARYLAND AND CONNECTICUT: All reported good control with Fermate spray (2 to 4 - 100) and dust (15%). Karbam (black) was also tested and found satisfactory at a number of locations. Dithane Z-78 spray (2 to 3 - 100) and dust (10%) was also effective. Parzate gave good control but caused slight injury at rates that were somewhat excessive. Virginia reported outstanding control of anthracnose with Parzate. Connecticut reported that Oxyquinoline benzoate (1-100) and Phygon (2-100) gave good blue mold control but caused serious plant injury.

HOP

DOWNY MILDEW:

CALIFORNIA: Dithane Z-78 (2-100), basic copper sulphate (6-100) and Spergon (4-100) all gave excellent control.

RESULTS WITH SOIL STERILIZATION AND FUMIGATION

CARROT

ROOT KNOT:

NEW YORK: Tests were conducted both on muck and upland farms. DD and Dowfume W10 (20 - 30 gallons per acre) increased yields of bunched carrots from 37-50% to 73-92%. Greenhouse tests indicated that on the basis of effectiveness per unit of cost, ethylene dibromide is the most powerful nematicide, followed in descending order by DD, methyl bromide and chloropicrin. DD, methyl bromide and ethylene dibromide mixtures penetrate fresh solid galls in 2 to 4 hours. Chloropicrin penetrates galls effectively only after they are decayed. On the basis of residual phytotoxicity, the rating was chloropicrin (most), DD, and methyl bromide (least).

CUCUMBER

ROOT KNOT:

SOUTH CAROLINA: Broadcast treatments with DD and Dowfume W40 (20 g.p.a.) were compared with row treatments of the same materials (6.7 g. p. a.). Yield increases ranged from 23 to 53%. Broadcast treatments were superior to row treatments and DD gave larger increases than W40.

GREEN BEANS

ROOT KNOT:

NORTH CAROLINA: Soil applications were made in the fall and spring with DD, Dowfume W40, and chloropicrin at 20, 40, and 60 g.p.a. All treatments gave effective root knot control. Chloropicrin and DD at 60 g.p.a. in the fall, and the same materials at 40 and 60 g.p.a. applied in the spring, caused plant injury and reduced yields.

PEA

ROOT KNOT:

FLORIDA: DD and Soilfume 80-20 (23 g.p.a.) were applied 2 weeks before seed sowing. DD caused severe injury to the pea crop while the ethylene dibromide mixture did not.

TOMATO

ROOT KNOT:

FLORIDA: Row fumigation with DD and Dowfume W40 (9g.p.a.) gave respectively 85 and 35% control of root knot.

TOBACCO

ROOT KNOT AND MEADOW NEMATODE:

FLORIDA (Gainesville): DD at 20 g.p.a. broadcast, and Dowfume W40 at 15 g.p.a. increased yields of flue-cured tobacco by 437 and 562 pounds of cured leaf per acre. Disease conditions were extremely severe and by the end of the crop season infestation was again general in all plots.

(Quincy): Experiments with shade tobacco showed that DD (20-23 g.p.a.) and W40 (14-16 g.p.a.) applications made early in September were more effective than applications in December. Early February treatments were stillless effective. Increases in yields were 12 to 16% and the results with DD and W40 were about equal.

GEORGIA: Dowfume W40 and DD were compared using row treatments of 5, 10, and 15 g.p.a. and broadcast treatments of 15 and 20 g.p.a. Nematode infection was very heavy and the average yield for untreated checks was only 672 pounds with returns of $287 per acre. Row treatment at 5 g.p.a. increased yields to 1642 pounds (mean of 4 plots) and value to $867 per acre. The highest rate of treatment, 20 g.p.a. gave an average yield of 1662 pounds per acre and a crop value of $862. Thus under the conditions of this experiment the differences between treatment rates were negligible. Also there was no significant difference between the results secured with DD and W40. The tobacco for the treated plots averaged $52 to $53 per 100 pounds, that for the check plots $41. In other tests there were no differences between row applications made in a single stream or in 2 parallel streams.

SOUTH CAROLINA: Row treatments with DD and Dowfume W40 at 5, 10, and 15 g.p.a. and broadcast treatments at 20 and 30 g.p.a. were compared. All treatments gave increased yields of cured leaf -- the increases ranging from 125 to 411 pounds per acre. Corresponding increases in acre value were $90 to $271 per acre. In this experiment the gains in yield and crop value were in proportion to the amounts of fumigant applied. Unit for unit W40 gave somewhat better nematode control than DD but there was no difference between the two in yield or crop value increases. Tobacco from the treated plots sold for 3 to 9 dollars per

100 pounds more than that from the untreated checks.

SUGAR BEET

NEMATODE:

UTAH: Dowfume N and DD (25 g.p.a.) were applied broadcast. Yield increases of 225% were secured at one location and of 92 and 100% at another. Wireworm control was also a factor in the results secured.

COTTON

FUSARIUM WILT:

ALABAMA: DD and Iscobrome D were compered in row application at 3.5, 7 and 14 g.p.a. The 3.5 rate of DD controlled the wilt and increased the yield of lint cotton by 45%. This rate appeared to be most economical when used in connection with a resistant variety. Approximately 10 g.p.a. of Iscobrome D was required for comparable results. Applied at seeding time DD caused crop injury while Iscobrome D did not.

MISCELLANEOUS NOTES

DAMPING-OFF (PYTHIUM):

NEW YORK: In tight containers, 25 cc of Dowfume G per cubic foot for 3 to 6 hours gave good control.

TESTS WITH NEW ORGANIC INSECTICIDES

SOUTH CAROLINA: Isotox 5 pounds per acre in the fertilizer had no effect on yield (cucumber).

NORTH CAROLINA: Benzene hexachloride (6% g.i.), DDT (50%), Parathion (25%), Chlordane (50%), and Chlorinated Camphene were tested in soil applications against root knot. None showed any nematicidal value.

Similar negative findings have been reported by Mr. Norman Allen at the Pee Dee Experiment Station, South Carolina.

GEORGIA: DD and ethylene dibromide soil treatments have consistently controlled southern stem rot (S. rolfsii) on tobacco. They have also given partial control of Fusarium wilt (F. oxysporum var nicotianae)

SOUTH CAROLINA: The above fumigants gave no control of the sore shin disease of tobacco caused by Rhizoctonia solani.

CONCLUSION

In conclusion we may note as very suggestive the outstanding results obtained at several locations with low rates -- 3.5 and 5 g.p.a. -- and the indication that temporary reduction in numbers of nematodes -- not elimination -- is the profitable objective. Progress would be facilitated by the development of a simple accurate, inexpensive, row application drill. Though the results are not entirely conclusive it appears that medium and low rate fumigant treatments may be safely applied as little as 10 days before seed sowing and 12 days before plant setting. Ethylene dibromide mixtures are eliminated from the soil more rapidly then the propene-propane type.

RESULTS FROM SEED TREATMENT TESTS

Forms for reporting results from seed-treatment tests were sent to 45 workers in 26 States and 4 Canadian Provinces. Reports were received from 30 individuals or cooperating groups in 21 States and 3 Provinces. Replies from nine workers stated that no results were available. The relative meagerness of data on seed treatments suggests a tendency on the part of many investigators to abandon this type of work after the intensive wide-spread activity in this field during and immediately after the late war. The appearance of new fungicides on the market, however, and changes in materials previously tested, make it desirable that such tests be continued.

Twenty-two commercial fungicides and 18 experimental materials were reported as having been tested on seed of one or more of 26 crops. These reports are summarized in table 1.

BARLEY

In Ontario Helminthosporium sativum infection was controlled by Panogen with 56% in the check. In Manitoba, Panogen and the Ceresans controlled a light infection of covered smut. In Saskatchewan, Panogen controlled covered smut (7%) and improved emergence.

OATS

In somewhat extensive greenhouse and field experiments in Ontario, N. I. Ceresan, Panogen and R118A were outstanding in the control of seed-borne Helminthosporium victoriae. With 15.5% infection in the checks, oat smut was eliminated in one experiment by R-118 A and Aresan, and reduced to less than 0.5% by seven other materials, four of which along with Arasan are not usually found effective in controlling smut in naturally infected seed. In Kansas, in experiments in 36 counties seed treatment with the Ceresans resulted in a 20 % increase in yield from seed of varieties susceptible to Victoria blight but did not increase yields from seed of resistant varieties. The Ceresans also controlled oat smut, but Arasan, Spergon and Phygon were found unsatisfactory for teating oat seed. Similar results on oat smut control were reported from North Carolina.

WHEAT

Reports from Kansas and three Canadian Provinces indicate that in general Ceresan M and N. I. Ceresan continue to be the preferred treat-

Table 1. Summary of Seed Treatment Reports for 1948

Crop	Reports received: number	Materials tried: number	States and Provinces represented	Best results obtained from
Barley	3	10	Man., Ont., Sask.	N.I. Ceresan, Ceresan M, Panogen
Oats	4	15	Ont., Sask., Kans., N. Car.	N.I. Ceresan, Ceresan M, R118A Panogen, Leytosan
Wheat	4	13	Ont., Man., Sask., Kans.	N.I. Ceresan, Ceresan M, Phygon, Arasan, Spergon, Panogen
Rice	4	8	Tex., Ark., La., Calif.	Yellow Cuprocide, Arasan, Ceresan M, Phygon, Spergon
Sorghum	2	9	Calif., Md., Nebr.	Phygon XL, Arasan, Spergon, Ceresan M, Panogen
Corn	4	8	Misc., Ill., Nebr., Ia	Arasan, Phygon, Spergon
Flax	2	10	Man., Ont.	Ceresan M, N.I. Ceresan
Cotton	2[a]	4	N. Car., S. Car., and other States	Ceresan M, Dow 9 B, Seedox, Dow F-800
Sugar-beets	3[a]	8	Ten States and Manitoba	Phygon, N.I. Ceresan, Ceresan M, Arasan
Peanuts	2	8	Ala., S. Car.	Arasan, Phygon, Dow 9B, Spergon
Soybeans	1	2	N. Car.	Arasan
Peas	5	24	Ont., Ida., S. Car., Miss., Pa.	Arasan, Spergon, Phygon, Tribasic, C. & C., Zerlate
Beans	4	16	Colo., Miss., Ida., S. Car.	Arasan, Spergon, Dithane Z-78, Phygon
Potatoes	1	10	Nebr.	Arasan, Dithane dip
Onion	2	5	Mich., Ia.	Arasan, Dithane Z-78, formaldehyde
Tomato	2	9	S. Car., Pa.	Arasan, Cuprocide, Phygon
Misc. Veg.	1	8	S. Car.	Phygon, Ceresan M, Arasan, Spergon

[a] One report summarizes results of widespread cooperative tests.

ments for wheat for general disease control. Several other materials, however, have at times proved equal to these in controlling bunt and improving emergence; among these are Phygon, Arasan, Spergon, Panogen, Leytosan and Lunasan. The choice of materials in such cases will be governed by price, availability, and ease of application.

RICE

Results from four States differed because of differences in environment, methods and rates of application, interval between treating and sowing, methods of seeding, and varieties used. Arasan, Ceresan M, and Yellow Cuprocide were rated first most frequently but Phygon, Spergon, and Dow 9 B also rated well in improving emergence and controlling seedling blight. Increases in emergence, however, were not always reflected in increased yields. In general, all rice treatments are applied by the slurry method.

SORGHUM

Sorghum seed is treated largely to control covered kernel smut and to improve emergence by controlling seedling blight. Reports from 3 States indicate that Phygon XL, Arasan, and Spergon are the most effective in improving stands but that the mercurials, Ceresan M (dust or slurry), N. I. Ceresan, and Panogen, are superior in smut control especially in varieties whose seeds have persistent glumes. Care must be exercised in using mercury treatments, as a too heavy application or prolonged storage after treatment may result in abnormal sprouting. Varieties differ in this sensitivity to mercury treatments.

CORN

Reports from 4 States indicate that Arasan, Phygon and Spergon are the leading fungicides for treating seed corn. In general practice they are applied as a slurry, but they are equally effective as dusts. At 3 locations in Nebraska, although emergence from treated seed was very slightly better than from untreated seed, the yield was about 3% less.

Reports from Illinois, Iowa, and Wisconsin seem to rule out Panogen as a treatment for corn. The older treatment materials: Merko, Barbak C and Semesan Jr., are no longer on the market.

FLAX

N.I.Ceresan or Ceresan M at 1.5 ounces per bushel is the only recommendation received. In Royal Flax, Panogen applied at the rate of 4-1/2 fluid ounces per bushel reduced infection by *Alternaria linicola* in a plate test to 27.5% compared with 45% in untreated seed. However, many seed-

lings showed injury from overtreatment.

COTTON

Experiments with Ceresan M, Dow 9B, Dow F-800 and Seedox were carried out at 13 stations. Ceresan M was slightly superior, and Dow-F-800 was inferior to Dow 9B and Seedox. All were applied at 3 grams per kilogram of seed. Dow 9B and Seedox have the advantage of being non-poisonous to livestock.

SUGAR BEETS

An extensive cooperative seed-treatment project was carried out in 1948 involving 24 cooperators at 22 locations in 10 States and one Canadian Province. The seed used was U. S. 215 x 216. It was processed and treated at Rocky Ford, Colorado and sent to the different cooperators for uniform planting.

Phygon, N. I. Ceresan and Ceresan M, Arasan, and copper trichlorphenate were effective in improving emergence and stand in the order named. Seed treatments resulted in significantly better stands at 13 of the 22 locations; Phygon and Ceresan M each caused significant increases in 11 of these tests, N. I. Ceresan in 10, Arasan in 6 and copper trichlorphenate in only 4. In 9 locations none of the treatments caused significant increases.

Phygon showed no indications of injury to germination, even in treated seed that had been stored for 3 years. N. I. Ceresan showed some injury to germination in seed that had been stored under humid conditions. Similar data on the effects of Ceresan M are not yet available.

Four lots of pelleted seed were compared with seed that was not pelleted and either left untreated or treated with N. I. Ceresan. Nine of the 22 tests gave significant differences in stand. Treatment with N. I. Ceresan resulted in significant increases in 6 tests; pelleted seed with 5% by weight of Arasan in 8 tests; pelleted seed with 10% of Arasan and 2% treble super-phosphate gave significant increases in 5 tests; pelleted seed containing no fungicide or fertilizer was superior to untreated seed in only one test and inferior in 5 tests. In general, seed treated with N. I. Ceresan, gave results comparable to the best pellets.

In California, in experiments with European seed heavily infected with Phoma betae, the only effective treatments were the organic mercurials such as ethyl mercury phosphate spray (.0125% solution), a 20 minute dip in a 1 to 24000 solution, or a spray with Ceresan M (0.25% in water). Nitroso-Pyrazole and Phygon XL were effective against damping off by Pythium ultimum.

PEANUTS

In Alabama, Arasan, Phygon, Dow 9 B, or Spergon, all at 2 or 3 ounces per 100 lbs. of seed, were rated best for combating seedling blight. Ceresan M at a relatively heavy dosage reduced germination. In South Carolina, Seedox, Ceresan M, Arasan, Phygon and Spergon, and Dow 9 B, Cuprocide, and Semesan in the order named improved emergence.

PEAS

In Ontario, Bioquin 75, Phygon, and Dow F-800, at 2, 3 and 2 ounces per bushel respectively, gave the best control of Ascochyta spp. in Thos. Laxton peas, while Zerlate (1-1/2 oz.) Phygon and Spergon (3 oz.) produced the best yields. In Idaho, Phygon, Arasan, and Spergon were rated best for seed decay and damping-off in this same variety. In Pennsylvania, Carbon and Carbide "A", tribasic copper sulfate, Spergon, and Arasan were rated in that order in the control of damping-off in Laxton Progress peas. In Mississippi, the order of effectiveness in increasing yields was: Spergon, Fermate, Ceresan M., Phygon, and Arasan S. F. In South Carolina, Phygon XL, Semesan, Arasan, Ceresan M, Spergon, Dow 9 B, and Seedox all gave highly significant increases in emergence.

BEANS

In Idaho, Phygon, Arasan, and Spergon (dust or slurry) are recommended for seed decay and damping-off in garden and field beans. Ceresan M injured the seed. In extensive trials in Mississippi, Arasan and Spergon seemed most consistent in improving emergence and at the same time increasing yields. Ceresan M, 2% Ceresan, Semesan, and Puratized 177 were at times beneficial to emergence and stand. Phygon was not included. In Colorado, Fusarium root rot on Pinto bean responded slightly more to Dithane 78, crude Penicillin, and Ceresan M than to the materials more commonly used.

POTATOES

In one report from Nebraska, Arasan dust, Dithane D-14 dip, Dithane Z-78 dust, Fermate, and B-K dip, in the order named, were effective in preventing seed piece decay in Red Warba potatoes. Spergon, Emulsept dip, zinc oxide, and Kopper King were ineffective.

ONIONS

In onion-smut experiments in Michigan, the best control, stands, and yields were obtained with Dithane Z-78 and Arasan diluted, 1 to 3 with talc and applied in the rows at 8 pounds per acre. In Iowa, formaldehyde (1 to 75) applied at 115 gallons per acre was best in onion smut control, with Arasan second, while Dithane Z-78 and Arasan produced the best stands.

OTHER CROPS

In North Carolina, in one experiment with soybeans, Arasan was far superior to Dow F-800 in its effect on emergence. In Pennsylvania, Arasan and tribasic copper sulphate were best in controlling damping-off in tomatoes; Carbon and carbide were also good while Cuprocide caused stunting.

In South Carolina in germination and stand tests with seeds of a number of crops, the materials ranking first, second, and third respectively, for the different crops were:

Spinach: Cuprocide, Spergon, Phygon XL;
Carrot: Cuprocide, Arasan, Ceresan M;
Lettuce: Arasan, Ceresan M, Cuprocide;
Tomato: Cuprocide, Arasan, Phygon XL;
Beet: Phygon XL, Cuprocide, Ceresan M;
Paprika: Ceresan M, Cuprocide, Seedox;
Sweet corn: Arasan, Spergon, Phygon XL;
Snap bean: Ceresan M, Cuprocide, Semesan;
Kidney bean: Ceresan M, Phygon, (no close third);
Cucumber: Phygon XL, Ceresan M, Semesan;
Musk melon: Phygon XL, Seedox, Ceresan M;
Watermelon: Phygon XL, Spergon, Seedox;
Okra: Spergon, Phygon XL, Ceresan M;
Dow 9B caused significant increases in some cases.

GENERAL APPRAISAL OF FUNGICIDES FOR SEED TREATMENT

ARASAN: For seeds of corn, flax, peanut, sorghum, soybean and other forage crops, sugar beet, and most vegetables. Controls bunt in wheat but is not recommended for diseases of barley and oats.

CERESAN M: For seed of barley, oats, wheat, flax, sorghum, rice, cotton, sugar beet, and certain vegetables.

N. I. CERESAN: For seed of barley, oats, wheat, flax and sugar beet.

CUPROCIDE: For seed of rice, peanut, and most vegetables except cabbage and cucumber.

DITHANE: D-14 and Z-78: Both were effective for seed-piece decay in potatoes while Z-78 prevented smut in onions and Fusarium root-rot in beans; neither was extensively tested.

DOW 9-B: For seed of cotton, peanut, pea, rice and some vegetables.

DOW F-800: Used on seed of cotton, oats, pea, and some other crops

but usually was inferior to other materials. It failed to control oat smut.

FORMALDEHYDE: Still the most effective for preventing onion smut.

LEYTOSAN: Used on seed of cereals in Canada but was generally inferior to the Ceresans in cereal disease control.

PANOGEN: For seed of barley, oats, wheat, and sorghum but unsuitable for corn. This material is a recent introduction from Sweden where it has been approved for seed of cereals and sugar beet. It should be more widely tested.

PHYGON XL: For seed of corn, rice, sorghum, wheat, sugar beet, peanut, pea, bean, and most vegetables.

SEEDOX: Promising for cotton seed but needs more testing.

SPERGON: For seed of corn, rice, sorghum, wheat, peanut, pea, bean, and most vegetables. Controls bunt in wheat but is not recommended for seed of barley and oats.

OTHER MATERIALS: R118-A was promising on seed of oats in Canada; Lunasan, phenyl mercury acetate, and Agrosan 9N showed some promise on wheat; copper carbonate controlled bunt as usual; a number of other materials were insufficiently tested to evaluate their effectiveness.